Operating Manual

SUNNY TRIPOWER 5.0 / 6.0 / 8.0 / 10.0 SMART ENERGY

ENGLISH

STPx0-3SE-40-BE-en-10 | Version 1.0

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You can download the current warranty conditions from the Internet at www.SMA-Solar.com.

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The licenses for the installed software modules (open source) can be found in the user interface of the product.

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1 Information on this Document

1.1 Validity

This document is valid for:

- STP5.0-3SE-40
- STP6.0-3SE-40
- STP8.0-3SE-40
- STP10.0-3SE-40

1.2 Target Group

This document is intended for qualified persons and end users. Only qualified persons are allowed to perform the activities marked in this document with a warning symbol and the caption "Qualified person". Tasks that do not require any particular qualification are not marked and can also be performed by end users. Qualified persons must have the following skills:

- Knowledge of how an inverter works and is operated
- Knowledge of how batteries work and are operated
- Training in how to deal with the dangers and risks associated with installing, repairing and using electrical devices, batteries and installations
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of all applicable laws, standards and directives
- Knowledge of and compliance with this document and all safety information
- Knowledge of and compliance with the documents of the battery manufacturer with all safety information

1.3 Content and Structure of this Document

This document describes the mounting, installation, commissioning, configuration, operation, troubleshooting and decommissioning of the product as well as the operation of the product user interface.

You will find the latest version of this document and further information on the product in PDF format and as eManual at www.SMA-Solar.com. You can also call up the eManual via the user interface of the product.

Illustrations in this document are reduced to the essential information and may deviate from the real product.

1.4 Levels of warning messages

The following levels of warning messages may occur when handling the product.

⚠ DANGER
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE
Indicates a situation which, if not avoided, can result in property damage.

1.5 Symbols in the Document

Icon	Explanation
ℹ	Information that is important for a specific topic or goal, but is not safety-relevant
☐	Indicates a requirement for meeting a specific goal
☑	Desired result
✖	A problem that might occur.
	Example
⚠ QUALIFIED PERSON	Sections describing activities to be performed by qualified persons only

1.6 Typographical Elements in the Document

Typographical element	Use	Example
bold	• Messages • Terminals • Elements on a user interface • Elements to be selected • Elements to be entered	• Connect the insulated conductors to the terminals **X703:1** to **X703:6**. • Enter **10** in the field **Minutes**.
>	• Connects several elements to be selected	• Go to **Settings > Date**.
[**Button**] [**Key**]	• Button or key to be clicked on or pressed down	• Select [**Enter**].
#	• Placeholder for variable components (e.g., parameter names)	• Parameter **WCtlHz.Hz#**

1.7 Designations in the Document

Complete designation	Designation in this document
Sunny Tripower Smart Energy	Inverter, product

1.8 Additional Information

For more information, please go to www.SMA-Solar.com.

Title and information content	Type of information
"Approved Batteries and Information on Battery Communication Connection" Overview of approved batteries	Technical Information
"PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication"	Technical Information
"SMA Smart Home" The System Solution for Greater Independence	Planning Guidelines
"Efficiency and Derating" Efficiency and derating behavior of the SMA inverters	Technical Information
"Parameters and Measured Values" Overview of all inverter operating parameters and their configuration options	Technical Information
"Modbus® parameters and measured values" Device-specific list of the Modbus register	Technical Information
"Temperature Derating"	Technical Information

2 Safety

2.1 Intended Use

The Sunny Tripower Smart Energy is a transformerless hybrid inverter with 2 MPP trackers and a battery connection that feeds the direct current of the PV array into the connected battery or converts it to grid-compliant three-phase current and then feeds it into the utility grid. The Sunny Tripower Smart Energy also converts the direct current supplied by the battery into grid-compliant three-phase current. In a system with additional PV inverters, the Sunny Tripower Smart Energy can convert the three-phase current generated by the PV inverters into direct current and feed it into the battery.

The Sunny Tripower Smart Energy has a battery-backup function. In the event of a power outage, the Sunny Tripower Smart Energy can continue to supply selected circuits with power from the battery and PV system.

The product is suitable for indoor and outdoor use.

The product must only be operated with PV modules of protection class II in accordance with IEC 61730, application class A. The PV modules must be compatible with this product.

The product is not equipped with an integrated transformer and therefore has no galvanic isolation. The product must not be operated with PV modules whose outputs are grounded. This can cause the product to be destroyed. The product may be operated with PV modules whose frame is grounded.

The product must only be operated in connection with an intrinsically safe lithium-ion battery approved by SMA Solar Technology AG. An updated list of the batteries approved by SMA Solar Technology AG can be found in the technical information "Approved Batteries and Information on Battery Communication Connection" at www.SMA-Solar.com.

The battery must comply with the locally applicable standards and directives and must be intrinsically safe (see technical information "SMA Flexible Storage System - Detailed explanations of the safety concept" for detailed explanations regarding the safety concept of battery inverters by SMA Solar Technology AG).

The communication interface of the battery used must be compatible with the product. The entire battery voltage range must be completely within the permissible input voltage range of the product. The maximum permissible DC input voltage of the product must not be exceeded.

The product is not suitable for supplying life-sustaining medical devices. A power outage must not lead to personal injury.

All components must remain within their permitted operating ranges and their installation requirements at all times.

The product must only be used in countries for which it is approved or released by SMA Solar Technology AG and the grid operator.

The product may only be operated with one of the energy meters approved by SMA Solar Technology AG. The following energy meters are allowed to be used when operating this product:

- EMETER-20 (SMA Energy Meter)
- HM-20 (Sunny Home Manager 2.0)

Use SMA products only in accordance with the information provided in the enclosed documentation and with the locally applicable laws, regulations, standards and directives. Any other application may cause personal injury or property damage.

Alterations to SMA products, e.g., changes or modifications, are only permitted with the express written permission of and according to the instructions from SMA Solar Technology AG. Unauthorized alterations can be dangerous and lead to personal injury. In addition, an unauthorized alteration will void guarantee and warranty claims and in most cases terminate the operating license. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

Any use of the product other than that described in the Intended Use section does not qualify as appropriate.

The enclosed documentation is an integral part of this product. Keep the documentation in a convenient, dry place for future reference and observe all instructions contained therein.

This document does not replace any regional, state, provincial, federal or national laws, regulations or standards that apply to the installation, electrical safety and use of the product. SMA Solar Technology AG assumes no responsibility for the compliance or non-compliance with such laws or codes in connection with the installation of the product.

The type label must remain permanently attached to the product.

2.2 IMPORTANT SAFETY INSTRUCTIONS

Keep the manual for future reference.

This section contains safety information that must be observed at all times when working.

The product has been designed and tested in accordance with international safety requirements. As with all electrical or electronical devices, there are residual risks despite careful construction. To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and observe all safety information at all times.

⚠ DANGER

Danger to life due to electric shock when touching live system components during battery-backup operation

Even if the AC miniature circuit breaker and the DC load-break switch of the inverter are disconnected, parts of the system may still be live when the battery is switched on due to battery-backup operation.

- Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document.
- Ensure that the grounding conductors of the electric circuits of the battery-backup appliances are connected to the grounding busbar of the house connection box.

⚠ DANGER

Danger to life due to electric shock when live components or DC cables are touched when working on the battery

The DC cables connected to the battery can be energized even when the battery is disconnected if the inverter has not been disconnected. Touching live DC cables results in death or serious injury due to electric shock.

- Prior to performing any work on the battery, disconnect the inverter from all voltage sources as described in this document.

⚠ DANGER

Danger to life due to electric shock when live components or DC cables are touched

The DC cables connected to a battery or a PV module may be live. Touching live DC cables results in death or serious injury due to electric shock.

- Disconnect the product and battery from voltage sources and make sure it cannot be reconnected before working on the device.
- Observe all safety information of the battery manufacturer.
- Do not touch non-insulated parts or cables.
- Do not disconnect the DC connectors under load.
- Wear suitable personal protective equipment for all work on the product.

⚠ DANGER

Danger to life due to electric shock when live components are touched on opening the product

High voltages are present in the live parts and cables inside the product during operation. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Do not open the product.

⚠ DANGER

Danger to life due to electric shock from touching an ungrounded PV module or array frame

Touching ungrounded PV modules or array frames results in death or lethal injuries due to electric shock.

- Connect and ground the frame of the PV modules, the array frame and the electrically conductive surfaces so that there is continuous conduction. Observe the applicable local regulations.

⚠ DANGER

Danger to life due to electric shock when touching live system components in case of a ground fault

If a ground fault occurs, parts of the system may still be live. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Disconnect the product and battery from voltage sources and make sure it cannot be reconnected before working on the device.
- Only touch the cables of the PV modules on their insulation.
- Do not touch any parts of the substructure or frame of the PV array.
- Do not connect PV strings with ground faults to the inverter.

⚠ DANGER

Danger to life due to electric shock in case of overvoltages and if surge protection is missing

Overvoltages (e. g. in the event of a flash of lightning) can be further conducted into the building and to other connected devices in the same network via the network cables or other data cables if there is no surge protection. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Ensure that all devices in the same network and the battery are integrated into the existing surge protection.
- When laying the network cables or other data cables outdoors, it must be ensured that a suitable surge protection device is provided at the transition point of the cable from the product or the battery outdoors to the inside of a building.
- The Ethernet interface of the product is classified as "TNV-1" and offers protection against overvoltages of up to 1.5 kV.

⚠ DANGER

Danger to life due to electric shock when touching live enclosure parts with damaged grounding conductor

High voltages may be applied to the enclosure of the product if the grounding conductor of the AC connection is damaged or has not been connected correctly and the additional grounding has not been connected. Touching live enclosure parts results in death or lethal injuries due to electric shock.

- Connect additional grounding for the AC connection as described in this document.

⚠ WARNING

Danger to life due to fire and explosion

In rare cases, an explosive gas mixture can be generated inside the product under fault conditions. In this state, switching operations can cause a fire inside the product or explosion. Death or lethal injuries due to hot or flying debris can result.

- In the event of a fault, do not perform any direct actions on the product.
- Ensure that unauthorized persons have no access to the product.
- Do not operate the DC load-break switch on the inverter in case of an error.
- Disconnect the PV array from the inverter via an external disconnection device. If there is no disconnecting device present, wait until no more DC power is applied to the inverter.
- Disconnect the battery from the product via an external disconnection device. Do not operate the DC load-break switch on the product.
- Disconnect the AC circuit breaker, or keep it disconnected in case it has already tripped, and secure it against reconnection.
- Only perform work on the product (e.g., troubleshooting, repair work) when wearing personal protective equipment for handling of hazardous substances (e.g., safety gloves, eye and face protection, respiratory protection).

⚠ WARNING

Risk of injury due to toxic substances, gases and dusts.

In rare cases, damages to electronic components can result in the formation of toxic substances, gases or dusts inside the product. Touching toxic substances and inhaling toxic gases and dusts can cause skin irritation, burns or poisoning, trouble breathing and nausea.

- Only perform work on the product (e.g., troubleshooting, repair work) when wearing personal protective equipment for handling of hazardous substances (e.g., safety gloves, eye and face protection, respiratory protection).
- Ensure that unauthorized persons have no access to the product.

⚠ WARNING

Danger to life due to fire or explosion when batteries are fully discharged

A fire may occur due to incorrect charging of fully discharged batteries. This can result in death or serious injury.

- Before commissioning the system, verify that the battery is not fully discharged.
- Do not commission the system if the battery is fully discharged.
- If the battery is fully discharged, contact the battery manufacturer for further proceedings.
- Only charge fully discharged batteries as instructed by the battery manufacturer.

⚠ WARNING

Danger to life due to burns caused by electric arcs through short-circuit currents

Short-circuit currents in the battery can cause heat build-up and electric arcs. Heat build-up and electric arcs may result in lethal injuries due to burns.

- Disconnect the battery from all voltages sources prior to performing any work on the battery.
- Observe all safety information of the battery manufacturer.

⚠ WARNING

Danger to life due to electric shock from destruction of the measuring device due to overvoltage

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

- Only use measuring devices with a DC input voltage range of 1000 V or higher.

⚠ CAUTION

Risk of burns due to hot enclosure parts

The enclosure and the enclosure lid may get hot during operation. The DC load-break switch can not become hot.

- Do not touch hot surfaces.
- Wait until the inverter has cooled down before touching the enclosure or enclosure lid.

⚠ CAUTION

Risk of injury due to weight of product

Injuries may result if the product is lifted incorrectly or dropped while being transported or mounted.

- Transport and lift the product carefully. Take the weight of the product into account.
- Always have two persons mount and disassemble the product.
- Wear suitable personal protective equipment for all work on the product.

NOTICE

Damage to the DC connectors due to the weight of the product

The DC connectors mounted on the product may be damaged if the product is set down on them.

- Do not set the product down on its DC connectors.
- Do not remove the protective cover from the DC connectors until the product is installed on the wall mounting bracket.

NOTICE

High costs due to inappropriate Internet tariff

Depending on use, the data volume of the product transferred via the Internet may vary in size. The data volume depends, for example, on the number of devices in the system, the frequency of device updates, the frequency of data transfer to Sunny Portal or the use of FTP push. High costs for the Internet connection can be the result.

- SMA Solar Technology AG recommends using an Internet flat rate.

NOTICE

Damage to the product due to cleaning agents

The use of cleaning agents may cause damage to the product and its components.

- Clean the product and all its components only with a cloth moistened with clear water.

A country data set must be set for feed-in operation

To ensure the inverter begins feed-in operation during initial commissioning, a country data set must be set (for instance via the installation assistant on the user interface of the product, or via a communication product).

If no country data set is set, then feed-in operation will be stopped. This state is signaled by the green and red LEDs flashing simultaneously.

The inverter will automatically start feed-in operation only after the inverter configuration is completed.

3 Scope of Delivery

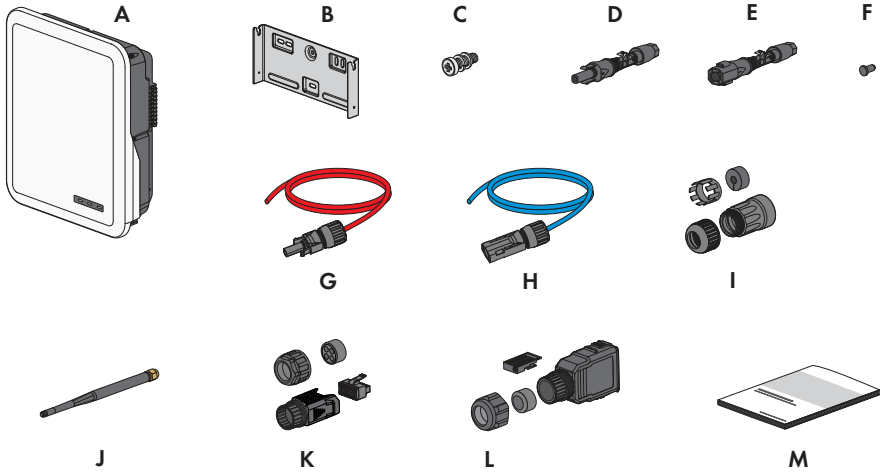


Figure 1: Components included in scope of delivery

Position	Quantity	Designation
A	1	Inverter
B	1	Wall mounting bracket
C	2	Pan head screw M4x14 with spring washer and washer
D	2/3	Positive DC connector (2 pieces for Sunny Tripower 5.0 SE, 6.0 SE and 8.0 SE, 3 pieces for Sunny Tripower 10.0 SE)
E	2/3	Negative DC connector (2 pieces for Sunny Tripower 5.0 SE, 6.0 SE and 8.0 SE, 3 pieces for Sunny Tripower 10.0 SE)
F	4/6	Sealing plug (4 pieces for Sunny Tripower 5.0 SE, 6.0 SE and 8.0 SE, 6 pieces for Sunny Tripower 10.0 SE)
G	1	Battery connection cable with positive DC connector
H	1	Battery connection cable with negative DC connector
I	2	RJ45 protective sleeve: swivel nut, cable support sleeve, threaded sleeve
J	1	WLAN antenna
K	1	COM connector for connection of battery communication and digital inputs and outputs: swivel nut, threaded sleeve, terminal

Position	Quantity	Designation
L	2	AC connector: swivel nut, sealing ring, connector enclosure, terminal, fuse terminal block
M	1	Quick reference guide with password label on the rear side The label contains the following information: • PIC (Product Identification Code) identification key for registering the system in Sunny Portal • RID (Registration Identifier) registration ID for registering the system in Sunny Portal • WLAN password WPA2-PSK (WiFi Protected Access 2 - Preshared Key) for direct connection to the inverter via WLAN

4 Product Overview

4.1 Product Description

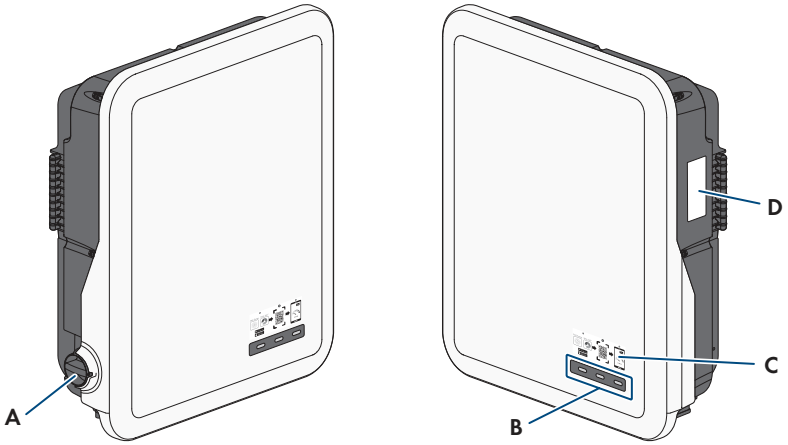


Figure 2: Design of the product

Position	Designation
A	DC load-break switch
B	LEDs The LEDs indicate the operating state of the product.
C	Label with QR Code for scanning via the SMA 360° App and easy connection to the inverter's user interface via WLAN
D	Type label The type label clearly identifies the product. The type label must remain permanently attached to the product. You will find the following information on the type label: • Device type (Model) • Serial number (Serial No. or S/N) • Date of manufacture • Identification key (PIC) for registration in Sunny Portal • Registration ID (RID) for registration in Sunny Portal • Wi-Fi password (WPA2-PSK) for the direct connection to the user interface of the product via Wi-Fi • Device-specific characteristics

4.2 Symbols on the Product

Icon	Explanation
	Beware of a danger zone This symbol indicates that the product must be additionally grounded if additional grounding or equipotential bonding is required at the installation site.
	Beware of electrical voltage The product operates at high voltages.
	Beware of hot surface The product can get hot during operation.
10 min	Danger to life due to high voltages in the inverter; observe a waiting time of 10 minutes. High voltages that can cause lethal electric shocks are present in the live components of the inverter. Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document.
	Observe the documentations Observe all documentations supplied with the product.
	Inverter Together with the green LED, this symbol indicates the operating state of the inverter.
	Observe the documentations Together with the red LED, this symbol indicates an error.
	Data transmission Together with the blue LED, this symbol indicates the status of the network connection.
AC 3N	Three-phase alternating current with neutral conductor
DC	Direct current
	The product has no galvanic isolation.

Icon	Explanation
	WEEE designation Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.
	The product is suitable for outdoor installation.
IP65	Degree of protection IP65 The product is protected against the penetration of dust and water that is directed as a jet against the enclosure from all directions.
	CE marking The product complies with the requirements of the applicable EU directives.
UK CA	UKCA marking The product complies with the regulations of the applicable laws of England, Wales and Scotland.
RoHS	RoHS labeling The product complies with the requirements of the applicable EU directives.
	RCM (Regulatory Compliance Mark) The product complies with the requirements of the applicable Australian standards.
	The product complies with the Moroccan safety and EMC requirements for electronic products.

4.3 Interfaces and Functions

The product is equipped with the following interfaces and functions:

User interface for configuration and monitoring

The product is equipped as standard with an integrated webserver, which provides a user interface for configuring and monitoring the product.

Once the connection has been established to the smart device, use a terminal (e.g. smartphone, tablet or laptop) to connect to the product's user interface using a web browser.

Smart Inverter Screen

The Smart Inverter Screen enables you to view the status display and to display the current power and consumption on the user interface login page. This gives you an overview of the most important product data without having to log into the user interface.

The Smart Inverter Screen is deactivated by default. The Smart Inverter Screen can be activated via the user interface once the product has been commissioned.

SMA Speedwire

The product is equipped with SMA Speedwire as standard. SMA Speedwire is a type of communication based on the Ethernet standard. SMA Speedwire is designed for a data transfer rate of 100 Mbps and enables optimum communication between Speedwire devices within systems.

The products supports the encrypted system communication with SMA Speedwire Encrypted Communication. In order to be able to use the Speedwire encryption in the system, all Speedwire devices, except for the SMA Energy Meter, must support the function SMA Speedwire Encrypted Communication.

SMA Webconnect

The product is equipped with a Webconnect function as standard. The Webconnect function enables direct data transmission between the product and Internet portals Sunny Portal and Sunny Places without any additional communication device and for a maximum of 4 products per visualized system. In PV systems with more than 4 products, there is the option of establishing data transmission between the products and Sunny Portal via the data logger (e.g. Sunny Home Manager) or distributing the inverters over several systems. If there is an existing Wi-Fi or Ethernet connection, you can directly access your visualized system via the web browser on your smart device (e.g. smartphone, tablet or laptop).

Wi-Fi connection to SMA 360° app and SMA Energy app

There is a QR code on the product by default. By scanning the QR Code attached to the product via the SMA 360° app or SMA Energy app, access to the product is established via Wi-Fi and the connection to the user interface is made automatically.

Wi-Fi

The product is equipped with a Wi-Fi interface as standard. The inverter is delivered with the WLAN interface activated as standard. If you do not want to use WLAN, you can deactivate the WLAN interface.

Modbus

The product is equipped with a Modbus interface. The Modbus interface is deactivated by default and must be configured as needed.

The Modbus interface of the supported SMA products is designed for industrial use – via SCADA systems, for example – and has the following tasks:

- Remote query of measured values
- Remote setting of operating parameters
- Setpoint specifications for system control
- Controlling the battery

Grid management services

The product is equipped with service functions for grid management.

Depending on the requirements of the grid operator, you can activate and configure the functions (e.g. active power limitation) via operating parameters.

Battery-backup function

The inverter is equipped with a battery-backup function. The battery-backup function is disabled by default and must be enabled via the user interface. The configuration is set on the user interface of the inverter.

The battery-backup function ensures that the inverter forms a three-phase battery-backup grid that uses energy from the battery and the PV system that is directly connected to the inverter to supply the circuits of the household grid in the event of a utility grid failure. If automatic battery-backup operation is activated, the selected backup loads connected to the **AC-BACKUP** terminal are connected and supplied to the **AC-GRID** terminal in parallel grid operation mode via an integrated bypass contactor. In the event of a grid failure, the contactor opens. The inverter provides a stand-alone grid and the backup loads continue to be supplied by the energy stored in the battery and the PV modules connected directly to the inverter.

The charging of the battery is ensured by the existing PV system during battery-backup operation. As soon as the utility grid is available again, the battery-backup operation is disabled automatically and the loads are supplied with energy from the household grid.

When the utility grid is down and the battery fully discharged, there is, in the beginning, not enough power available to create a stable battery-backup grid. In this case, the battery must be charged by the PV system. The inverter is able to create a stable battery-backup grid only when enough power is available in the battery. Battery-backup operation starts automatically as soon as enough energy is available from the PV system. By setting parameters, it is possible to define up to which state of charge the battery is charged and discharged. For example, it is possible to set the amount of energy that should remain in the battery for battery-backup operation.

Communication between the inverter and the SMA apps takes place via a direct Wi-Fi connection in battery-backup operation.

Do not connect any loads that require an uninterrupted energy supply

The battery-backup operation may not be used for loads that require a uninterrupted energy supply. The energy that is available during the battery-backup operation depends on the battery capacity available and the state of charge of the battery (SOC).

- Do not connect loads if they are dependent on an uninterrupted energy supply for reliable operation.

Multifunction Relay

The inverter is equipped with a multifunction relay as standard. The multifunction relay is an interface that can be configured for the operating mode used by a particular system.

SMA ShadeFix

The inverter is equipped with the shade management system SMA ShadeFix. SMA ShadeFix uses an intelligent MPP tracking system to determine the operating point with the highest output during shading conditions. With SMA ShadeFix, inverters use the best possible energy supply from the PV modules at all times to increase yields in shaded systems. SMA ShadeFix is enabled by default. The time interval of SMA ShadeFix is usually six minutes. This means that the inverter determines the optimum operating point every six minutes. Depending on the PV system or shading situation, it may be useful to adjust the time interval.

All-pole sensitive residual-current monitoring unit

The all-pole sensitive residual-current monitoring unit detects alternating and direct differential currents. In single-phase and three-phase inverters, the integrated differential current sensor detects the current difference between the neutral conductor and the line conductor(s). If the current difference increases suddenly, the inverter disconnects from the utility grid.

SMA Smart Connected

SMA Smart Connected is the free monitoring of the product via the SMA Sunny Portal. Thanks to SMA Smart Connected, the operator and qualified person will be informed automatically and proactively about product events that occur.

SMA Smart Connected is activated during registration in Sunny Portal. In order to use SMA Smart Connected, it is necessary that the product is permanently connected to Sunny Portal and the data of the operator and qualified person is stored in Sunny Portal and up-to-date.

4.4 LED Signals

The LEDs indicate the operating state of the product.

LED signal	Explanation
Green LED and red LED flash simultaneously (2 s on and 2 s off)	No country data set set Operation of the product is stopped because no country data set is set. Once the configuration has been completed (for instance using the installation assistant or via a communication product), the product will start operation automatically.
The green LED is flashing (two seconds on and two seconds off)	Waiting for feed-in conditions The conditions for feed-in operation are not yet met. As soon as the conditions are met, the inverter will start feed-in operation.
The green LED is flashing (1.5 s on and 0.5 s off)	Battery-backup operation The battery-backup operation function is activated and the inverter supplies the loads with energy from the battery.
The green LED is glowing	Feed-in operation The inverter is feeding in.
The green LED is off	No voltage is applied to the PV system or battery.
The red LED is glowing	Error Inverter operation has been stopped. In addition, a distinct event message and the corresponding event number will be displayed on the product user interface or in Sunny Portal.

LED signal	Explanation
Red LED is flashing (0.25 s on, 0.25 s off, 0.25 s on, 1.25 s off)	Warning Communication with a higher-level plant controller has failed. The inverter continues to operate with restricted function (e.g. with set fall-back level). In addition, a distinct event message and the corresponding event number will be displayed on the product user interface or in the communication product (e.g. Sunny Home Manager).
The blue LED flashes slowly for approx. 1 minute	Communication connection is being established The product is establishing a connection to a local network or is establishing a direct connection to a smart device via Ethernet (e.g. smartphone, tablet or laptop).
The blue LED is flashing fast (0.25 s on and 0.25 s off)	A communication product requests identification of the inverter.
The blue LED is glowing	There is an active connection with a local network (LAN/Wi-Fi) or there is a direct connection (Ethernet/WPS function) with a smart end device (e.g. smartphone, tablet or laptop).
Blue LED is off	There is no active connection.
All 3 LEDs are on	Inverter update or booting procedure

4.5 Battery Management

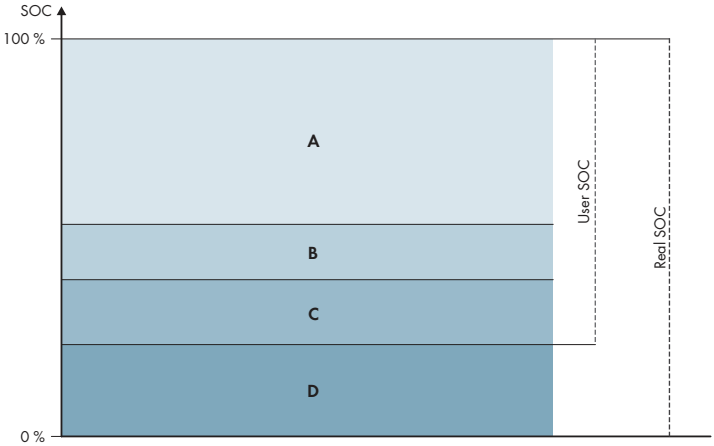


Figure 3: State of charge ranges of the battery

Range	Parameter	Hybrid inverter behavior
A	-	The hybrid inverter uses the battery within this range for increased self-consumption. When more energy is needed than can be supplied by the PV modules, the battery is discharged.
B	**Battery > Areas of application > Minimum width of backup power area (BatUsDm.BckDmMin)**	The value indicates the percentage of battery charge to be retained for battery-backup operation. This battery charge cannot be used in parallel grid operation, even if the battery-backup operation is deactivated.
C	**Device > Self-consumption > Lower battery discharge limit (BatChaSttMin)**	In this range, the battery is no longer discharged, even in battery-backup operation.
D	**Battery > Areas of application > Minimum width of deep discharge protection area (BatUsDm.DschProDmMin)**	The value specifies which percentage of the Real SoC is to be reserved as deep discharge protection. This value corresponds to a User SoC of 0%. When the state of charge is displayed as 0% (User SOC), the battery is actually (Real SOC) still charged to as much percentage as this value indicates.

5 SMA Energy System Home

5.1 System Components

The Sunny Tripower Smart Energy is part of the SMA Energy System Home. For more information on the SMA Energy System Home and the individual components, see www.SMA-Solar.com.

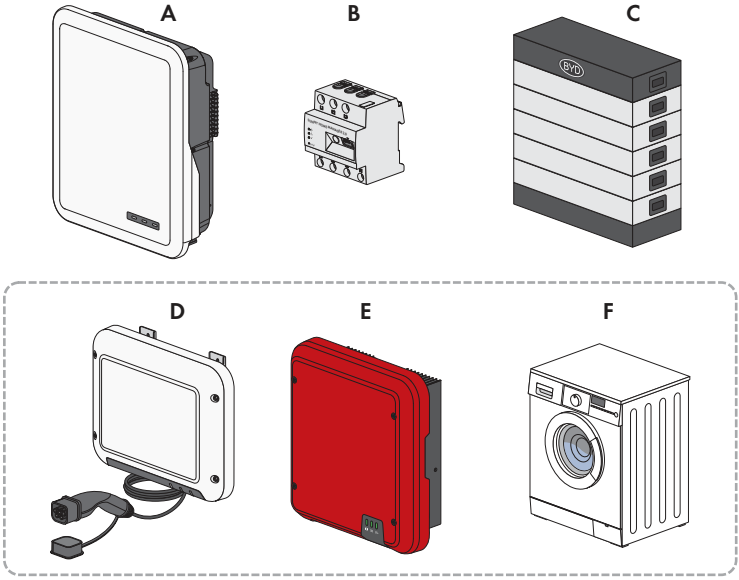


Figure 4: Main system components

Position	Designation
A	Sunny Tripower Smart Energy
B	Sunny Home Manager 2.0 The Sunny Home Manager is the central device responsible for energy management in households with a PV system for self-consumption. The Sunny Home Manager can carry out the following tasks: • Collection of energy- and power measured values in the interconnected household • Energy monitoring: Presentation of energy flows via Sunny Portal • Interconnection and networking of loads via EEBUS and SEMP • Energy management: Automatic control of interconnected household loads with the aim of energy efficiency optimization • Dynamic limiting of the active power feed-in • Active power measurement via integrated measuring unit with direct connection up to 63 A limiting current • Support of the Wi-Fi sockets Edimax SP-2101W to firmware version 2.08 and Edimax SP-2101W V2 from firmware version 1.00
C	Battery A list of the approved batteries can be found in the technical information "Approved Batteries and Information on Battery Communication Connection" at www.SMA-Solar.com
D	Optional: SMA EV Charger The SMA EV Charger is an AC charging station that is designed for unidirectional charging of a vehicle. The SMA EV Charger along with the Sunny Home Manager 2.0 makes an intelligent charging station that can charge your vehicle depending on the available solar power.
E	Optional: Additional PV inverters PV inverters that convert direct current from the PV modules into alternating current for the grid. The hybrid inverter can convert the three-phase current generated by the PV inverters into direct current and feed it into the battery. In battery-backup operation mode, power generated by additional PV inverters cannot be used.
F	Optional: controllable loads Appliances (e.g. washing machines, heat pumps) that are directly controlled by the Sunny Home Manager 2.0 or via EEBUBS or SEMP. You can find a list with compatible loads in the technical information ""SMA SMART HOME - Compatibility list for the Sunny Home Manager 2.0"" at www.SMA-Solar.com.

5.2 System Overview

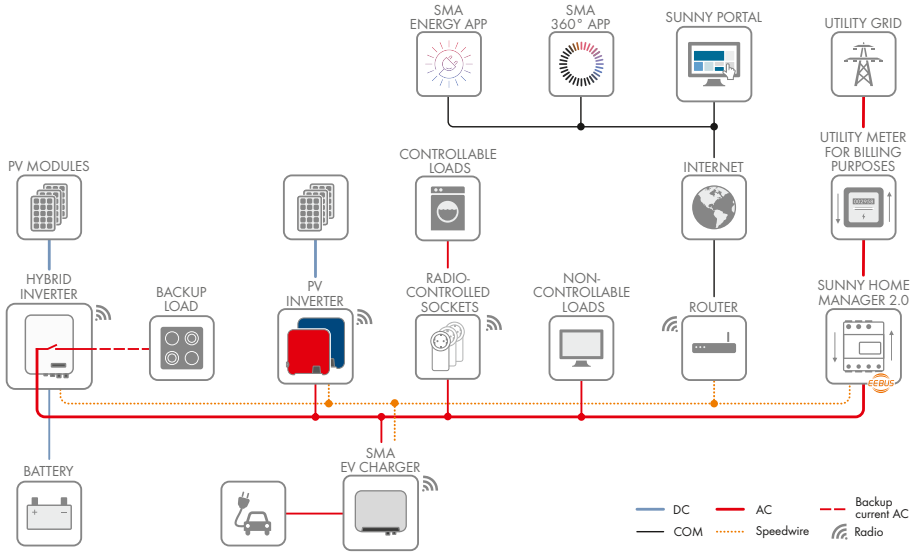


Figure 5: Design of the system

5.3 Circuitry Overview

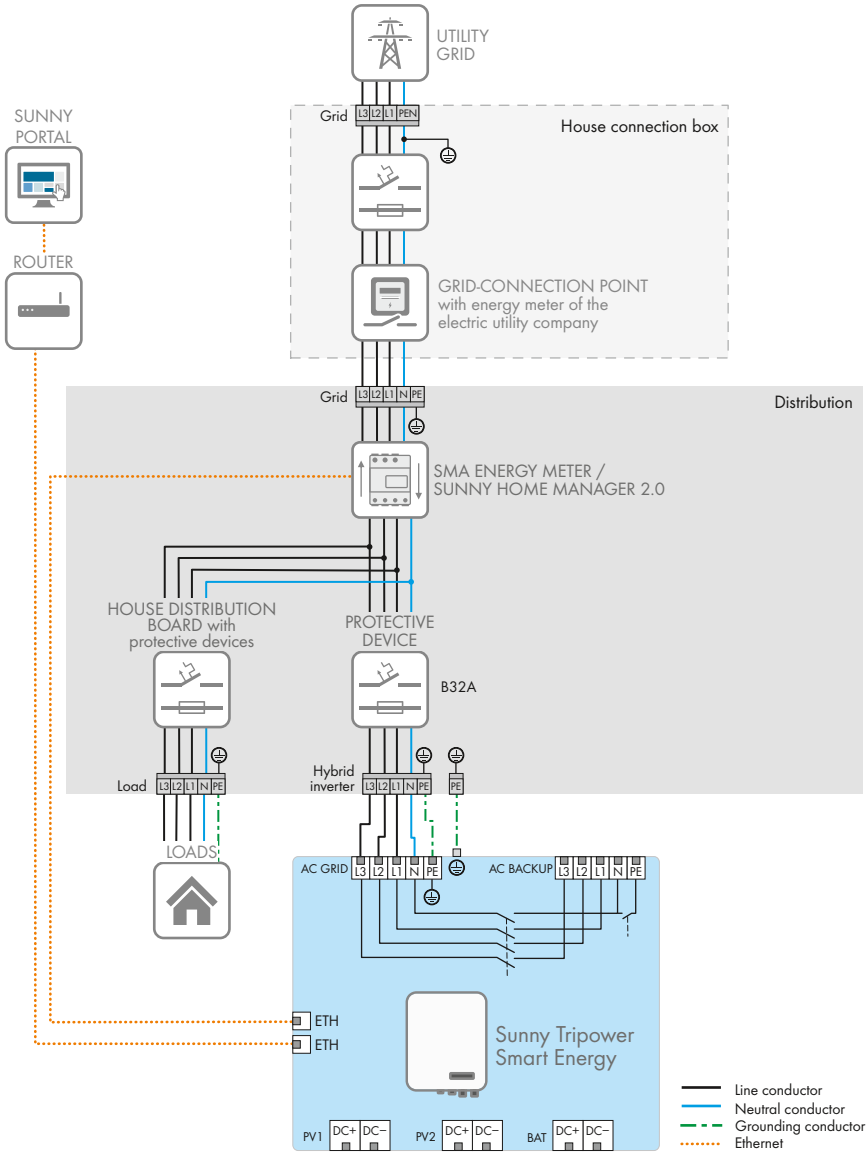


Figure 6: Circuitry overview without battery-backup system (example)

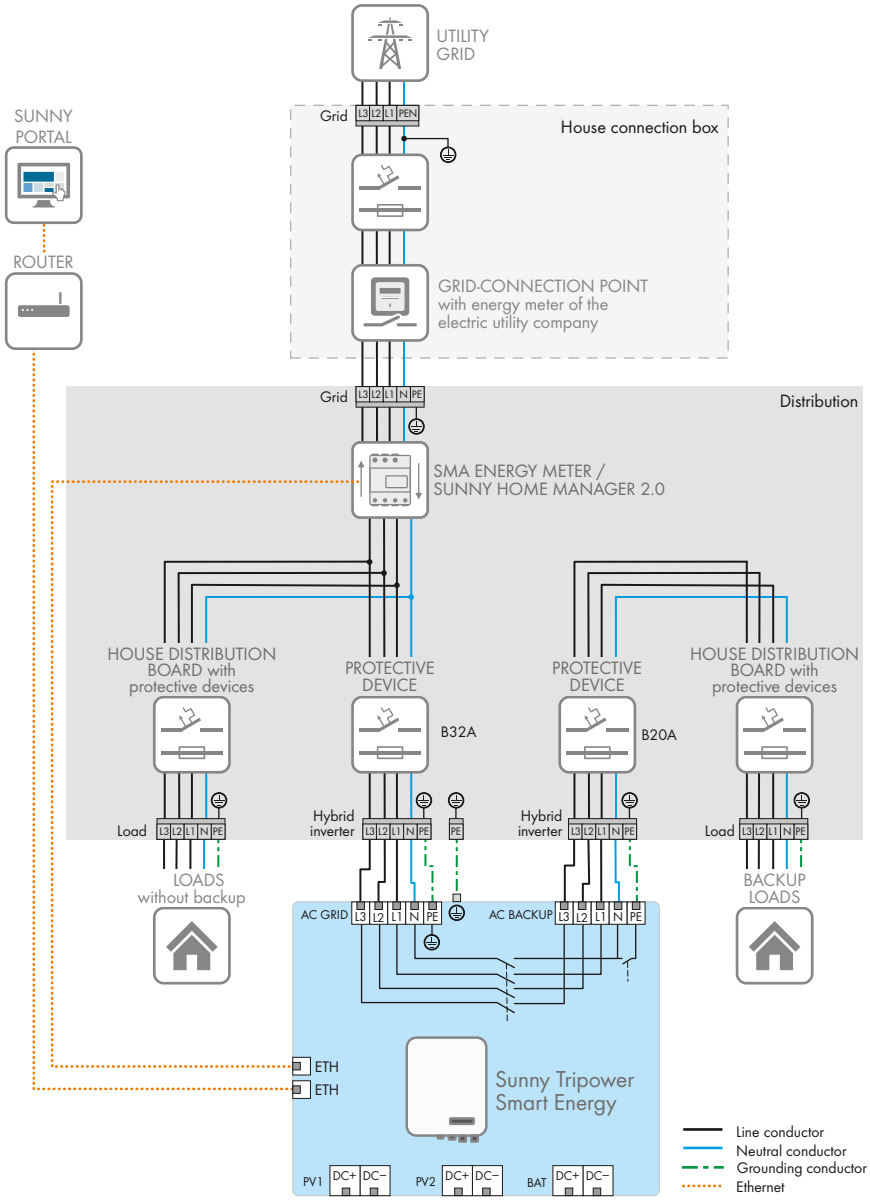


Figure 7: Circuitry overview with battery-backup system (example)

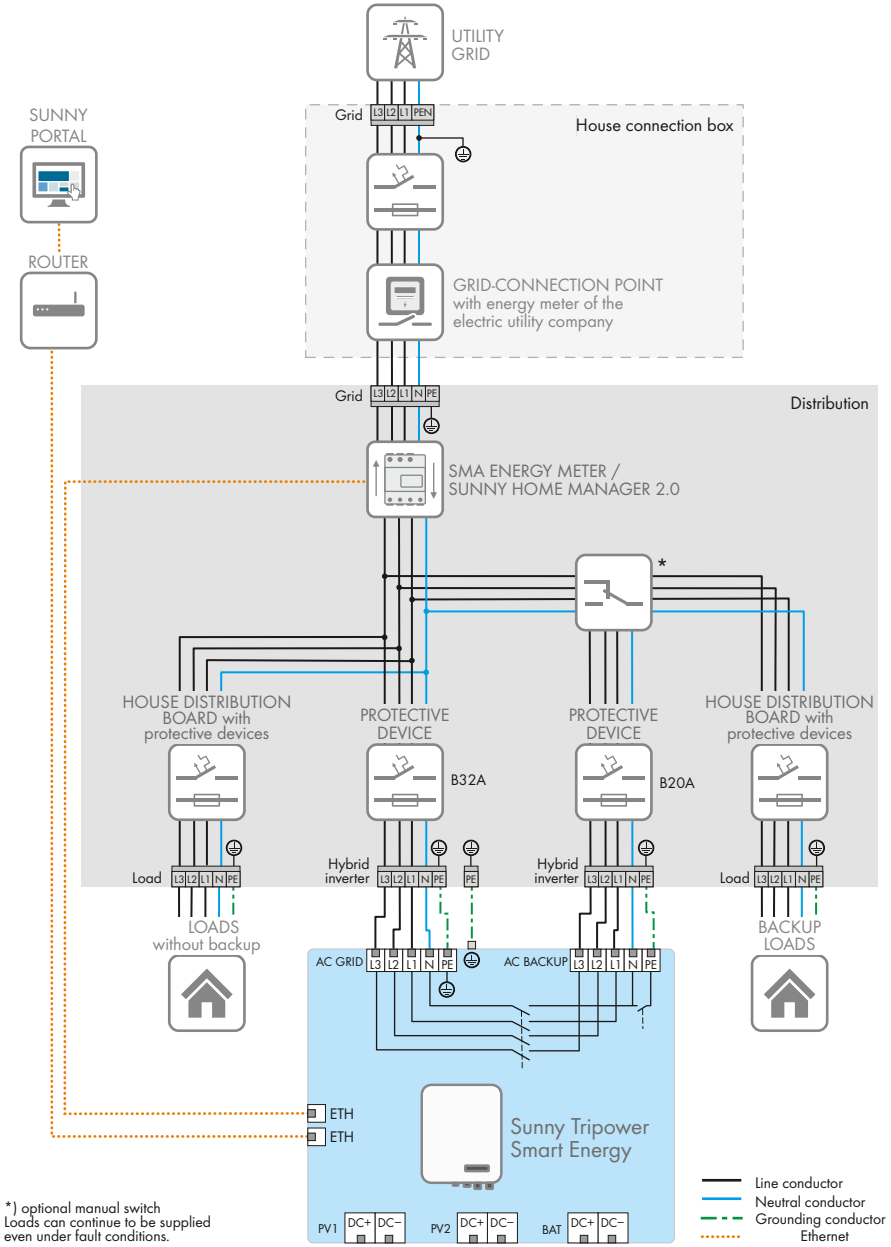


Figure 8: Circuitry overview with battery-backup system and optional transfer switch (example)

5.4 Communication Overview

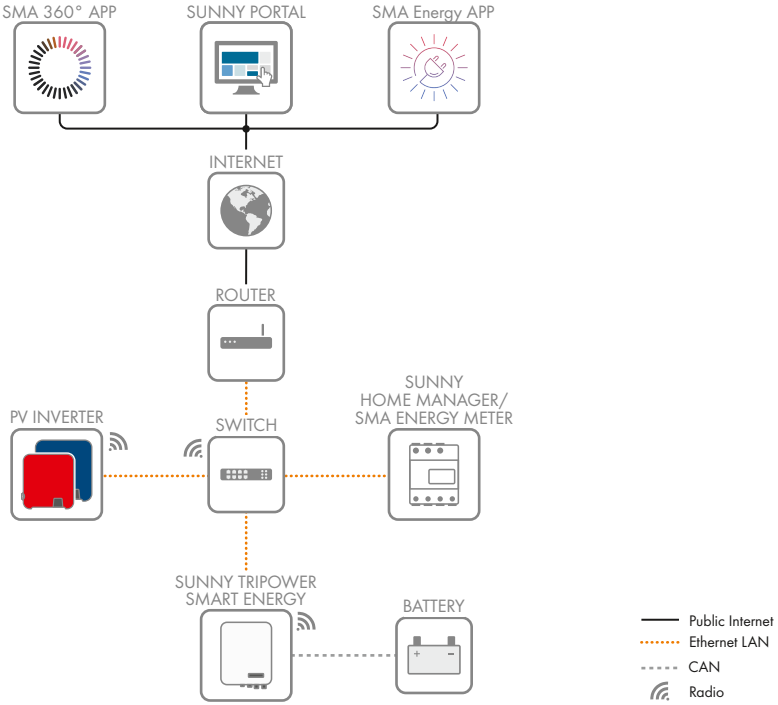


Figure 9: Design of system communication

6 Mounting

6.1 Requirements for Mounting

Requirements for the mounting location:

⚠ WARNING

Danger to life due to fire or explosion

Despite careful construction, electrical devices can cause fires. This can result in death or serious injury.

- Do not mount the product in areas containing highly flammable materials or gases.
- Do not mount the product in potentially explosive atmospheres.

☐ A solid support surface must be available (e.g., concrete or masonry). When mounted on drywall or similar materials, the product emits audible vibrations during operation which could be perceived as annoying.

☐ The support surface for installation must be made of a non-flammable material.

☐ The mounting location must be inaccessible to children.

☐ The mounting location must be suitable for the weight and dimensions of the product (see Section 16, page 122).

☐ The mounting location must not be exposed to direct solar irradiation. If the product is exposed to direct solar irradiation, the exterior plastic parts might age prematurely and overheating might occur. When becoming too hot, the product reduces its power output to avoid overheating.

☐ The mounting location should be freely and safely accessible at all times without the need for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfillment of these criteria may restrict servicing.

☐ The DC load-break switch of the product must always be freely accessible.

☐ All ambient conditions must be met (see Section 16, page 122).

☐ To ensure optimum operation, the ambient temperature should be between -25 °C and 45 °C.

Permitted and prohibited mounting positions:

☐ The product may only be mounted in a permitted position. This will ensure that no moisture can penetrate the product.

☐ The product should be mounted such that the LED signals can be read off without difficulty.

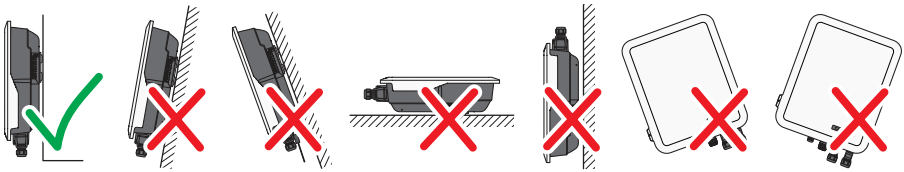


Figure 10: Permitted and prohibited mounting positions

Dimensions for mounting:

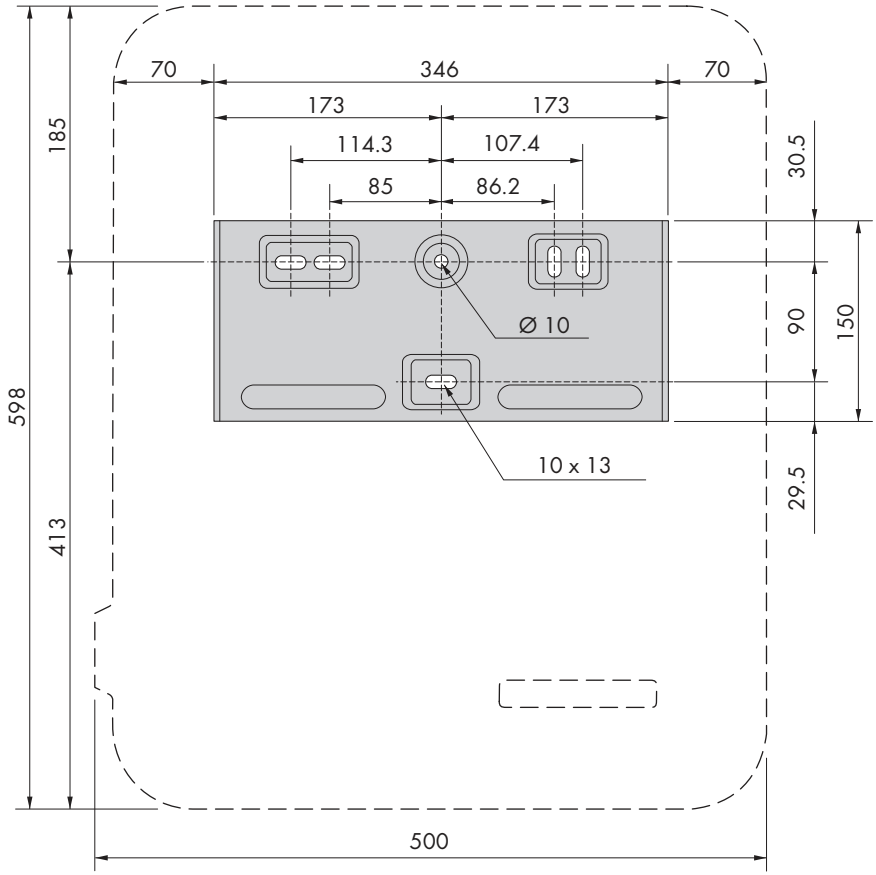


Figure 11: Position of the anchoring points(Dimensions in mm)

Recommended clearances:

If you maintain the recommended clearances, adequate heat dissipation will be ensured. Thus, you will prevent power reduction due to excessive temperature.

- ☐ Maintain the recommended clearances to walls as well as to other inverters or objects.
- ☐ If multiple products are mounted in areas with high ambient temperatures, increase the clearances between the products and ensure sufficient fresh-air supply. A sufficient supply of fresh air can be ensured, for example, by an external room fan controlled via the multifunction relay.

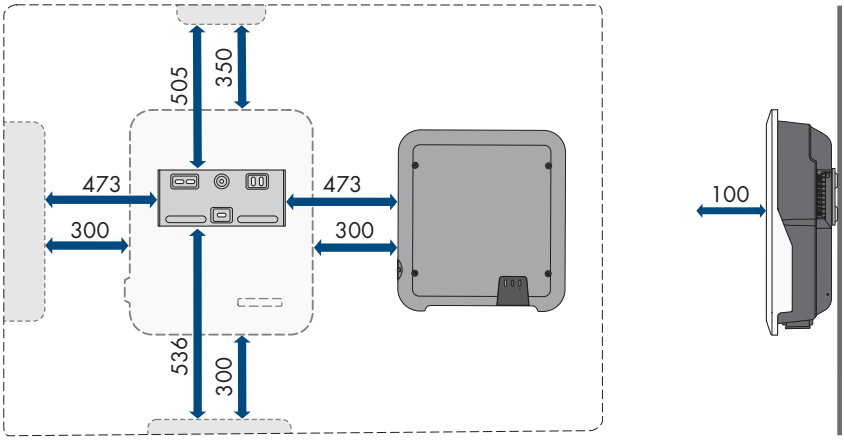


Figure 12: Recommended clearances(Dimensions in mm)

6.2 Mounting the product

Additionally required mounting material (not included in the scope of delivery):

- ☐ 3 screws, suitable for the support surface and the weight of the inverter (diameter: minimum 6 mm)
- ☐ 3 washers, suitable for the screws (outer diameter: minimum 18 mm)
- ☐ Where necessary, 3 screw anchors suitable for the support surface and the screws

⚠ CAUTION

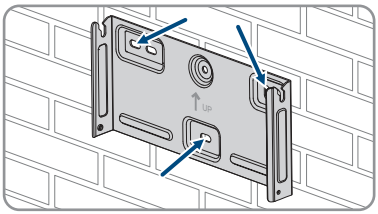
Risk of injury due to weight of product

Injuries may result if the product is lifted incorrectly or dropped while being transported or mounted.

- Transport and lift the product carefully. Take the weight of the product into account.
- Always have two persons mount and disassemble the product.
- Wear suitable personal protective equipment for all work on the product.

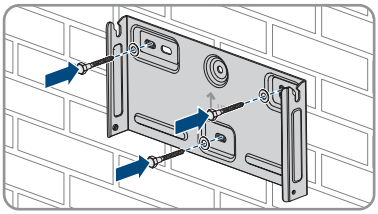
Procedure:

1. Align the wall mounting bracket horizontally on the wall and mark the position of the drill holes. Use at least 1 hole on the right- and left-hand side and the lower hole in the middle of the wall mounting bracket.

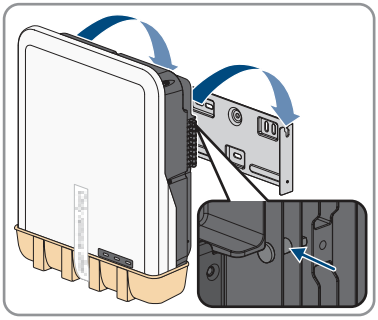


2. Set the wall mounting bracket aside and drill the marked holes.

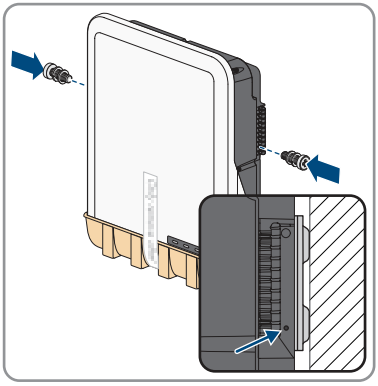
3. Insert screw anchors into the drill holes if the support surface requires them.
4. Secure the wall mounting bracket horizontally using screws and washers.



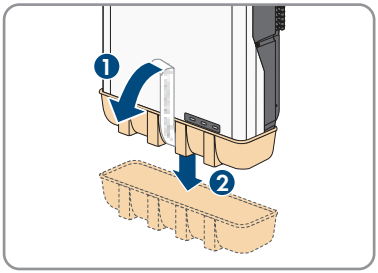
5. Hook the inverter into the wall mounting bracket. To do this, the 2 bolts on the right and left between the ribs on the back of the inverter must be hooked into the keyways of the wall mounting bracket.



6. Ensure that the inverter is securely in place.
7. Secure the inverter to the wall mounting bracket on both sides with a pan head screw (M4x14) provided. Use a magnetized screwdriver to insert a screw into the lower screw hole of the inverter's anchorage bracket and tighten it (PH2, torque: 1.5 Nm).



8. Remove the protective cover from the connection area.



7 Electrical Connection

7.1 Overview of the Connection Area

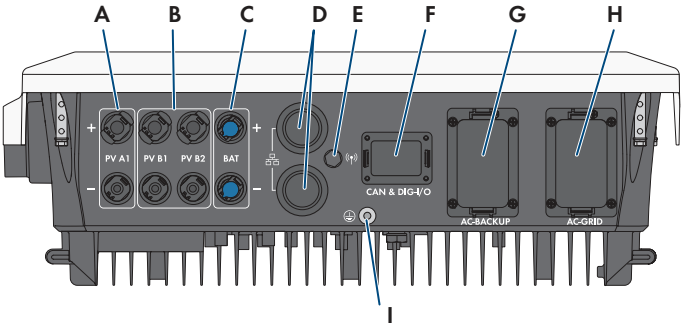


Figure 13: Connection areas at the bottom of the inverter

Position	Designation
A	1 positive and 1 negative DC connector (type: Sunclix), input A
B	1 positive and 1 negative DC connector (type: Sunclix) for Sunny Tripower 5.0 SE, 6.0 SE and 8.0 SE, 2 positive and 2 negative DC connectors (type: Sunclix) for Sunny Tripower 10.0 SE, input B
C	1 positive and 1 negative DC connector for battery (type: Multi-Contact MC4) connection
D	Network port with protective cap
E	Jack with protective cap for the WLAN antenna
F	**CAN & DIG-I/O** socket with protective cap for connection of COM connector
G	**AC-BACKUP** socket with protective cap for connection of AC backup loads. The protective cap may only be removed when backup loads are connected.
H	**AC-GRID** socket with protective cap for AC grid connection
I	Connection point for an additional grounding

7.2 AC Connection

7.2.1 Requirements for the AC Connection

AC cable requirements as follows:

- ☐ Conductor type: copper wire (flexible)
- ☐ External diameter: 14 mm to 25 mm
- ☐ Conductor cross-section: 1.5 mm² to 10 mm²

- ☐ Insulation stripping length: 12 mm
- ☐ Sheath stripping length: 80 mm to 90 mm
- ☐ The cable must be dimensioned in accordance with the local and national directives for the dimensioning of cables. The requirements for the minimum wire size derive from these directives. Examples of factors influencing cable dimensioning are: nominal AC current, the connected AC backup loads, type of cable, routing method, cable bundling, ambient temperature and maximum desired line losses (for calculation of line losses, see the design software "Sunny Design" from software version 2.0 at www.SMA-Solar.com).
- ☐ Recommendation: Use a cable with the marking H07

Residual-current monitoring unit:

The inverter does not require an external residual-current device when operating. If local regulations require the use of a residual-current device, the following must be observed:

- ☐ The inverter is compatible with type A residual-current devices with a rated residual current of 100 mA or higher (see Technical Information "Criteria for Selecting a Residual-Current Device" in www.SMA-Solar.com for information on how to select a residual-current device). Each inverter in the system must be connected to the utility grid via a separate residual-current device.

Overvoltage category:

The product can be used in grids of overvoltage category III or lower in accordance with IEC 60664-1. That means that the product can be permanently connected to the grid-connection point of a building. In case of installations with long outdoor cabling routes, additional measures to reduce overvoltage category IV to overvoltage category III are required (see the Technical Information "Overvoltage Protection" at www.SMA-Solar.com).

7.2.2 Connecting the Grounding

⚠ QUALIFIED PERSON

An additional grounding of the inverter is required to protect from touch current in case the grounding conductor fails at the terminal of the AC cable.

The inverter features a grounding terminal with 2 connection points for grounding (e.g. when using a grounding electrode).

The connection points have been labeled with the following symbol: ⏚

The required M5x12 screw with spring washer and washer is included in the scope of delivery of the inverter.

Additionally required material (not included in the scope of delivery):

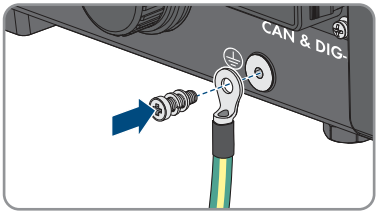
- ☐ 1 grounding cable
- ☐ 1 ring terminal lug M5

Cable requirements:

- ☐ Cross-section of grounding cable corresponds to the grounding conductor at the **AC-GRID** terminal, at least 2.5 mm^2

Procedure:

1. Strip the insulation of the grounding cable. Attach the ring terminal lug to the stripped wire using the required crimping tool.
2. Tighten the screw with washer and spring washer at one of the two connection points for the additional grounding (PH2, torque: 1.5 Nm).



7.2.3 Connecting the Inverter to the Utility Grid

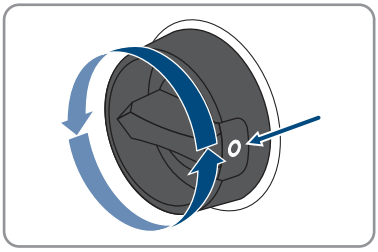
⚠ QUALIFIED PERSON

Requirements:

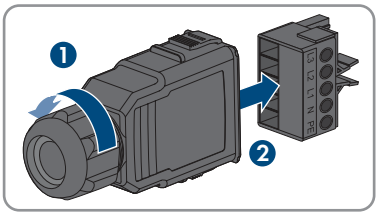
- ☐ The connection requirements of the grid operator must be met.
- ☐ The grid voltage must be within the permissible range. The exact operating range of the inverter is specified in the operating parameters.

Procedure:

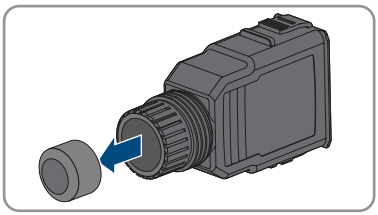
1. Disconnect the AC and backup miniature circuit breaker from all 3 line conductors and secure against reconnection.
2. Ensure that the DC load-break switch has been switched off and secured against reconnection.



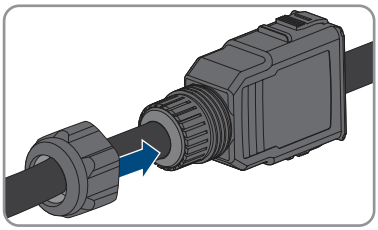
3. Ensure that the battery is switched off.
4. Label the AC connector for connection to the utility grid to prevent subsequent confusion with the AC connector for connection to the backup loads.
5. Unscrew the swivel nut of the AC connector and remove the terminal from the AC connector.



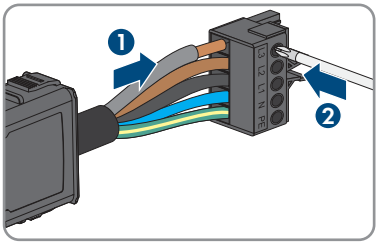
6. For a cable diameter of ≥ 19 mm, remove the inner sealing ring from the AC connector.



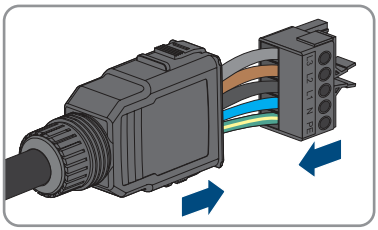
7. Route the AC cable through the swivel nut and connector enclosure.



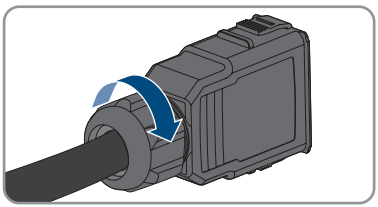
8. Dismantle the AC cable (80 mm to 90 mm).
9. Strip the insulation of L1, L2, L3, N and the grounding conductor (12 mm).
10. Insert the conductors L1, L2, L3, N, and grounding conductor into the terminal block according to the labeling and tighten the terminal block screws (PH2, torque: 1.5 Nm).



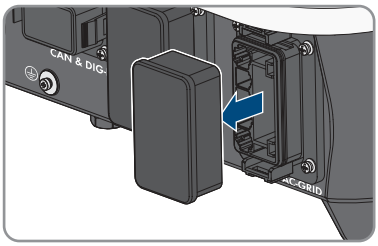
11. Ensure that the conductors are correctly assigned and firmly seated in the terminal.
12. Insert the terminal into the connector enclosure. The terminal must snap audibly into place.



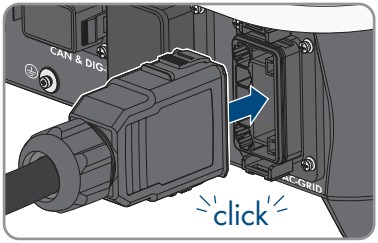
13. Tighten the swivel nut on the connector enclosure.



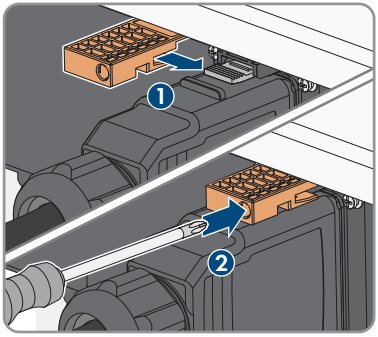
14. Remove the protective cap from the **AC-GRID** socket.



15. Insert the AC connector into the **AC-GRID** socket. The AC connector must snap audibly into place.



16. Slide the fuse terminal block onto the bracket of the AC connector from the left and screw tight (PH1, torque: 0.5 Nm).



7.2.4 Connecting the Battery-Backup Appliances

⚠ QUALIFIED PERSON

Backup loads, that are supplied from the battery in the event of a power outage, can be connected to the inverter.

⚠ DANGER

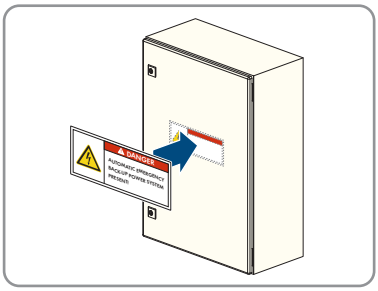
Danger to life due to electric shock when touching live system components during battery-backup operation

Even if the AC miniature circuit breaker and the DC load-break switch of the inverter are disconnected, parts of the system may still be live when the battery is switched on due to battery-backup operation.

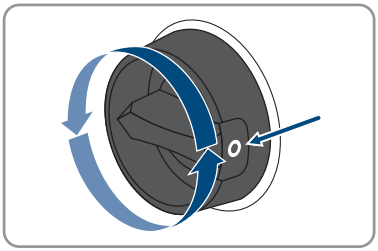
- Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document.
- Ensure that the grounding conductors of the electric circuits of the battery-backup appliances are connected to the grounding busbar of the house connection box.

Procedure:

1. Disconnect the AC and backup miniature circuit breaker from all 3 line conductors and secure against reconnection.
2. Place a notice on the subdistribution indicating the battery-backup operation of the inverter.

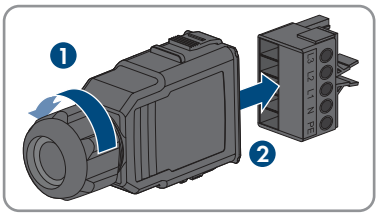


3. Ensure that the DC load-break switch has been switched off and secured against reconnection.

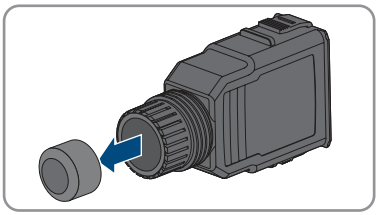


4. Ensure that the battery is switched off.
5. Label the AC connector for connection to the backup loads to prevent subsequent confusion with the AC connector for connection to the utility grid.

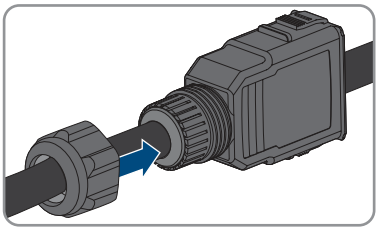
6. Unscrew the swivel nut of the AC connector and remove the terminal from the AC connector.



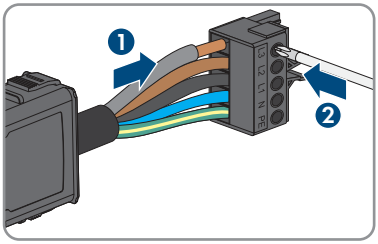
7. For a cable diameter of ≥ 19 mm, remove the inner sealing ring from the AC connector.



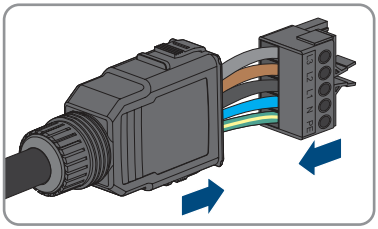
8. Route the AC cable through the swivel nut and connector enclosure.



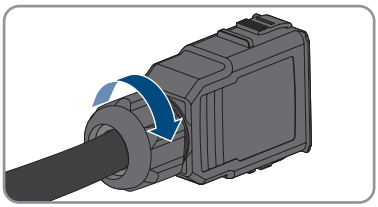
9. Dismantle the AC cable (80 mm to 90 mm).
10. Strip the insulation of L1, L2, L3, N and the grounding conductor (12 mm).
11. Insert the conductors L1, L2, L3, N, and grounding conductor into the terminal block according to the labeling and tighten the terminal block screws (PH2, torque: 1.5 Nm).



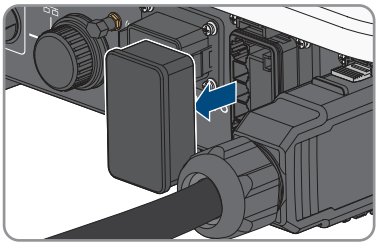
12.
13. Ensure that the conductors are correctly assigned and firmly seated in the terminal.
14. Insert the terminal into the connector enclosure. The terminal must snap audibly into place.



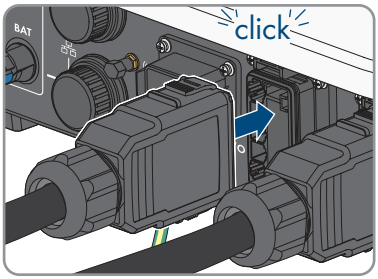
15. Tighten the swivel nut on the connector enclosure.



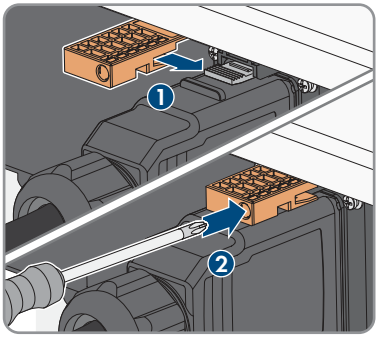
16. Remove the protective cap from the **AC-BACKUP** socket.



17. Insert the AC connector into the **AC-BACKUP** socket. The AC connector must snap audibly into place.



18. Slide the fuse terminal block onto the bracket of the AC connector from the left and screw tight (PH1, torque: 0.5 Nm).



19. Ensure that the grounding conductors of the electric circuits of the battery-backup appliances are connected to the grounding busbar of the house connection box. Otherwise the backup loads cannot be supplied with power.

7.3 Mounting the WLAN Antenna

⚠ QUALIFIED PERSON

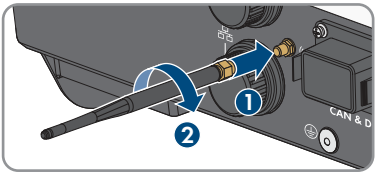
The Wi-Fi antenna must be mounted. Otherwise, the degree of protection of the product cannot be guaranteed.

Requirement:

☐ The Wi-Fi antenna supplied must be used.

Procedure:

1. Disconnect the product from voltage sources (see Section 10, page 86).
2. Remove the protective cap from the jack on the inverter.
3. Plug the Wi-Fi antenna into the jack and screw tight (torque: 1 Nm).



4. Pull on the Wi-Fi antenna to ensure that the Wi-Fi antenna is securely in place.

7.4 Connecting the Network Cables

⚠ QUALIFIED PERSON

⚠ DANGER

Danger to life due to electric shock in case of overvoltages and if surge protection is missing

Overvoltages (e. g. in the event of a flash of lightning) can be further conducted into the building and to other connected devices in the same network via the network cables or other data cables if there is no surge protection. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Ensure that all devices in the same network and the battery are integrated into the existing surge protection.
- When laying the network cables or other data cables outdoors, it must be ensured that a suitable surge protection device is provided at the transition point of the cable from the product or the battery outdoors to the inside of a building.
- The Ethernet interface of the product is classified as "TNV-1" and offers protection against overvoltages of up to 1.5 kV.

NOTICE

Product damage due to moisture penetration

Moisture penetration can damage the product and impair its functionality of the product.

- Connect the network cable with the supplied RJ45 protective sleeve to the product.

Additionally required material (not included in the scope of delivery):

- ☐ One or two network cables

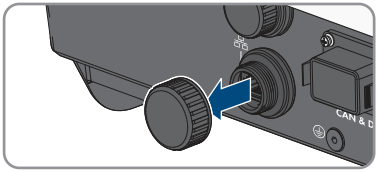
Network cable requirements:

The cable length and quality affect the quality of the signal. Observe the following cable requirements:

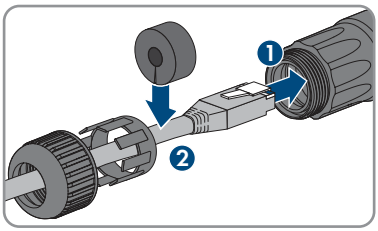
- ☐ Cable type: 100BaseTx
- ☐ Cable category: minimum CAT5e
- ☐ Plug type: RJ45 of Cat5, Cat5e or higher
- ☐ Shielding: SF/UTP, S/UTP, SF/FTP or S/FTP
- ☐ Number of insulated conductor pairs and insulated conductor cross-section: at least 2 x 2 x 0.22 mm²
- ☐ Maximum cable length between 2 nodes when using patch cables: 50 m
- ☐ Maximum cable length between 2 nodes when using installation cables: 100 m
- ☐ UV-resistant for outdoor use.

Procedure:

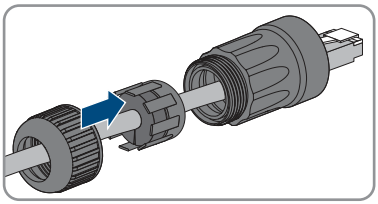
1. Disconnect the product from voltage sources (see Section 10, page 86).
2. Unscrew the protective cap from the network port.



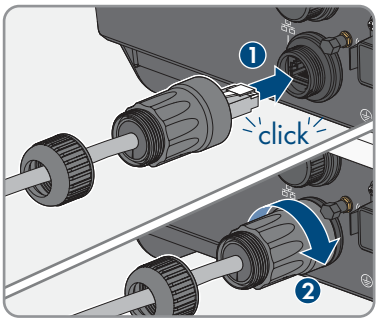
3. Press the cable support sleeve out of the threaded sleeve.
4. Feed the network cable through the swivel nut and threaded sleeve. Attach the cable support sleeve to the network cable.



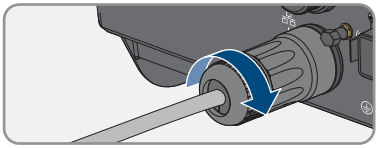
5. Press the cable support sleeve into the threaded sleeve.



6. Insert the network plug of cable into the product's network port. Ensure that the cable is correctly locked in place. Turn the threaded sleeve onto the thread of the network port on the product.



7. Screw the swivel nut onto the threaded sleeve.



8. If you would like to establish a direct connection, connect the other end of the network cable directly to the end device.
9. If you would like to integrate the product into a local network, connect the other end of the network cable to the local network (e.g. via a router).
10. If you want to connect the product to a communication product (e.g., Energy Meter, Sunny Home Manager), connect a second network cable to the second network socket as described in this section. Connect the other end of the second network cable to the communication product.

7.5 Connect the communication

7.5.1 Assignment of Terminal Block of COM Connector

The COM connector is used for battery communication via CAN. Furthermore, a ripple control receiver and a fast-stop switch can be connected via the digital inputs and outputs. A potential-free switching contact is available for controlling loads up to 30 V/1 A.

⚠ DANGER

Danger to life due to electric shock

When connecting signals with voltages above 30 V to the COM connector, there is a risk of life-threatening electric shock.

- Only connect signals with protective extra-low voltage (< 30 V).

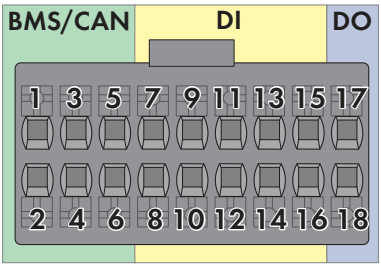


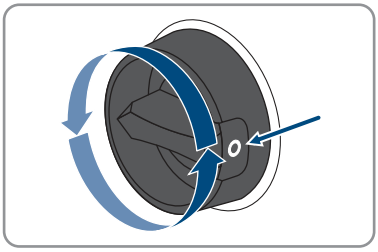
Figure 14: PIN overview

Pin	Pin assignment
BMS/CAN	
1	CAN H
2	Enable signal
3	CAN L
4	Enable ground
5	Not assigned
6	Shielding
DI	
7	Not assigned
8	Shielding
9	DI2
10	DI1
11	DI4
12	DI3
13	Fast stop
14	12 V
15	Not assigned
16	Not assigned
DO	
17	NO (Normally Open)
18	COM

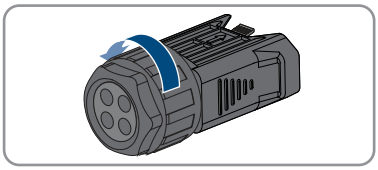
7.5.2 Connecting the COM Connector

⚠ QUALIFIED PERSON

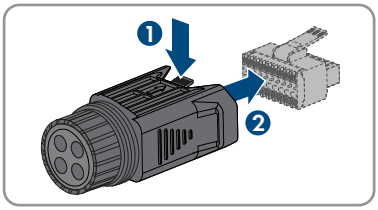
1. Disconnect the AC and backup miniature circuit breaker from all 3 line conductors and secure against reconnection.
2. Ensure that the DC load-break switch has been switched off and secured against reconnection.



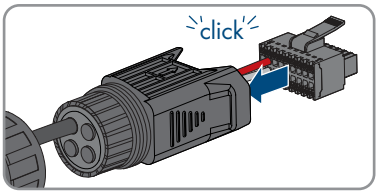
3. Ensure that the battery is switched off.
4. Unscrew the swivel nut from the threaded sleeve of the COM connector.



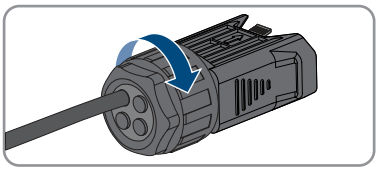
5. Remove the terminal from the threaded sleeve.



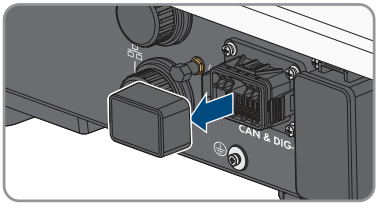
6. Connect the CAN communication cable (see Section 7.5.3, page 50).
7. Connect signal source to digital input (see Section 7.5.4, page 51).
8. Connect the display device or external fan to the multifunction relay (see Section 7.5.5, page 53).
9. Ensure that all conductors are plugged into the terminal points tightly by pulling slightly on the conductors.
10. Insert the terminal into the threaded sleeve. The terminal must snap audibly into place.



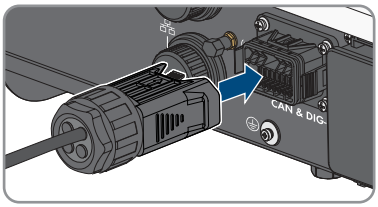
11. Tighten the swivel nut.



12. Remove the protective cap from the **CAN & DIG-I/O** socket.



13. Insert the connector for battery communication connection into the **CAN & DIG-I/O** socket. The connector must snap audibly into place on both sides.



7.5.3 Connecting CAN communication cable

⚠ QUALIFIED PERSON

Communication between inverter and battery

- Communication between the inverter and the battery takes place via the battery communication cable via CAN bus.

Additionally required material (not included in the scope of delivery):

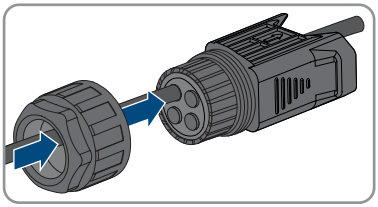
- ☐ 1 battery communication cable for the communication between inverter and battery
- ☐ Bootlace ferrules (only for multi-core stranded wire, usable length of the ferrule at least 12 mm)

Network cable (SBS to switch, battery to switch) requirements:

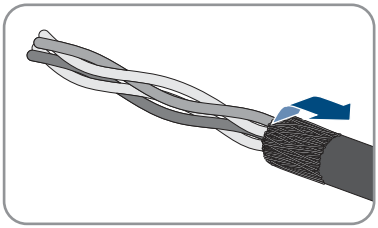
- ☐ Twisted pair conductors
- ☐ Cable category: minimum CAT5e
- ☐ Cable with shielding: Yes
- ☐ Conductor cross-section: 0.2 mm² to 1.5 mm²
- ☐ External diameter: 5.3 mm to 7 mm
- ☐ Maximum cable length: 10 m
- ☐ UV-resistant for outdoor use.
- ☐ Recommendation: Use a network installation cable with 1-core rigid wire
- ☐ Comply with the requirements of the battery manufacturer.

Procedure:

1. Remove 1 sealing plug from the cable support sleeve.
2. Lead the communication cable through the swivel nut and threaded sleeve.



3. Strip the communication cable 40 mm to 50 mm.
4. Trim the cable shield to a length of 15 mm and fold it over the cable sheath.



5. Strip the insulation on the insulated conductors each by 12 mm. The **CAN L** and **CAN H** must be a twisted pair.
6. If necessary, trim unused insulated conductors flush with the cable sheath or fold it over the cable sheath.
7. When using a multi-core stranded wire, provide the conductors with bootlace ferrules.
8. Connect the conductors of the communication cables to the terminal. Pay attention to the assignment of the terminal and communication connection on the battery and make sure that **CAN L** and **CAN H** consist of a pair of conductors. For additional information on how to connect the battery, see technical information "Approved Batteries and Information on Battery Communication Connection" at www.SMA-Solar.com.

7.5.4 Connecting Signal Source to Digital Input

⚠ QUALIFIED PERSON

It is possible to connect a digital signal source (e.g. ripple control receiver or remote terminal unit) to the digital input of the product. This must be connected if it is prescribed by the grid operator.

Additionally required material (not included in the scope of delivery):

- ☐ Connection cable
- ☐ Bootlace ferrules (only for multi-core stranded wire, usable length of the ferrule at least 12 mm)

Requirements for connection cable:

- Cable with shielding: Yes
- Conductor cross-section: 0.2 mm² to 1.5 mm²
- External diameter: 5.3 mm to 7 mm

- UV-resistant for outdoor use.

Requirements:

☐ The signal source must be technically suitable for connection to the digital inputs (see Section 16, page 122).

☐ The connected digital signal source has a safe separation to the grid potential.

Circuitry overview:

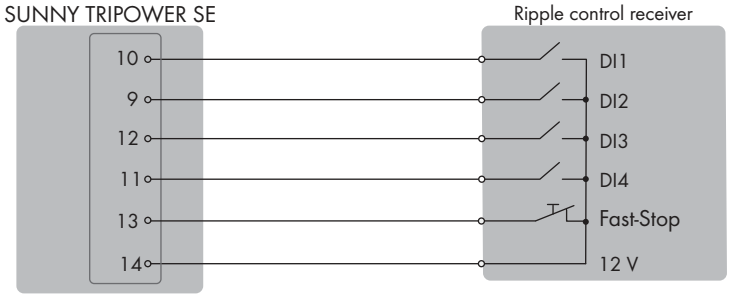
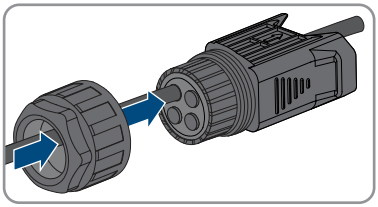


Figure 15: Connection of a Ripple Control Receiver

Procedure:

1. Connect the connection cable to the digital signal source (see the manual from manufacturer).
2. Remove 1 sealing plug from the cable support sleeve.
3. Lead the connection cable into the threaded sleeve.



4. Dismantle the connection cable 40 mm to 50 mm.
5. Strip the insulation on the insulated conductors each by 12 mm.
6. When using a multi-core stranded wire, provide the conductors with bootlace ferrules.
7. Connect the connection cable to the terminal block of the COM connector according to the assignment of the terminal block (see Section 7.5.1, page 47).

7.5.5 Connecting the Multifunction Relay

7.5.5.1 Procedure for connecting the multifunction relay

⚠ QUALIFIED PERSON

Procedure		See
1.	Select for which operating mode you would like to use the multifunction relay.	Section 9.13, page 79
2.	Connect to the multifunction relay according to the operating mode.	Section 7.5.5.2, page 53
3.	After commissioning the inverter, change the operating mode of the multifunction relay, if necessary.	Section 9.14, page 80

7.5.5.2 Connection to the Multifunction Relay

⚠ QUALIFIED PERSON

Additionally required material (not included in the scope of delivery):

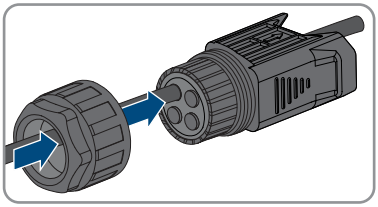
- Connection cable
- Bootlace ferrules (only for multi-core stranded wire, usable length of the ferrule at least 12 mm)

Requirements for connection cable:

- Conductor cross-section: 0.2 mm² to 1.5 mm²
- External diameter: 5.3 mm to 7 mm
- UV-resistant for outdoor use.

Procedure:

1. Remove 1 sealing plug from the cable support sleeve.
2. Lead the connection cable into the threaded sleeve.



3. Dismantle the connection cable 40 mm to 50 mm.
4. Strip the insulation on the insulated conductors each by 12 mm.
5. When using a multi-core stranded wire, provide the conductors with bootlace ferrules.
6. Connect the connection cable to the digital output of the inverter according to the assignment of the terminal block of the COM connector (see Section 7.5.1, page 47).

7.6 Connection of PV Modules

7.6.1 Requirements for the DC Connection

Connection options:

The inverter has 2 DC inputs. In case of STP5.0-3SE-40 / STP6.0-3SE-40 / STP8.0-3SE-40, 1 string can be connected to DC input A and 1 string can be connected to DC input B. In case of STP10.0-3SE-40, 1 string can be connected to DC input A and 2 strings to DC input B.

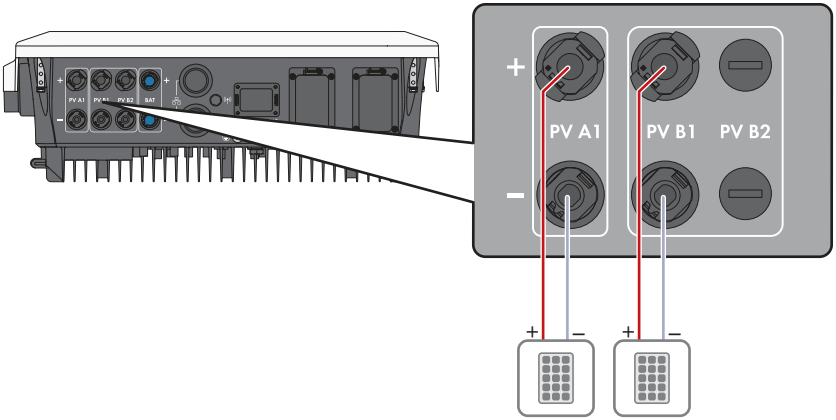


Figure 16: Connection overview with STP5.0-3SE-40 / STP6.0-3SE-40 / STP8.0-3SE-40

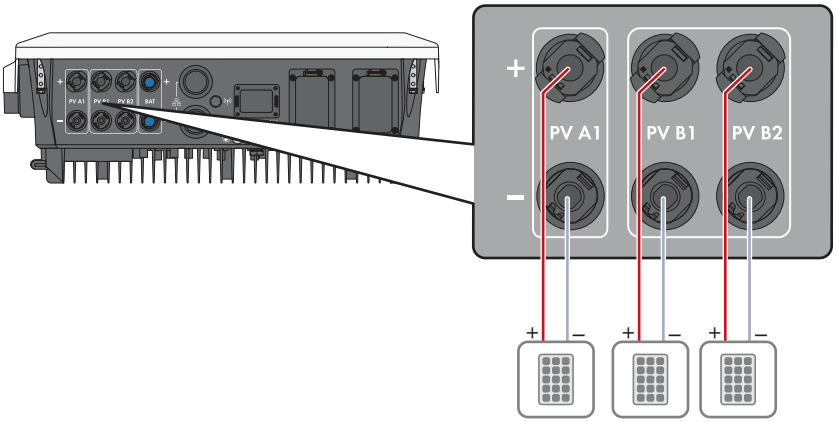


Figure 17: Connection overview with STP10.0-3SE-40

Requirements for the PV modules per input:

☐ All PV modules should be of the same type.

- ☐ All PV modules should be aligned and tilted identically.
- ☐ On the coldest day based on statistical records, the open-circuit voltage of the PV array must never exceed the maximum input voltage of the inverter.
- ☐ The same number of series-connected PV modules must be connected to each string.
- ☐ The maximum short-circuit current of a string must not exceed the maximum short-circuit current of the inverter (see Section 16, page 122).
- ☐ The thresholds for the input voltage of the inverter must be adhered to (see Section 16, page 122).
- ☐ The maximum usable input power may be exceeded (see Section 16, page 122). The power exceeding the specified value cannot be used.
- ☐ The positive connection cables of the PV modules must be equipped with positive DC connectors (see Section 7.6.2, page 55).
- ☐ The negative connection cables of the PV modules must be equipped with the negative DC connectors (see Section 7.6.2, page 55).

Use of Y adapters for parallel connection of strings

The Y adapters must not be used to interrupt the DC circuit.

- Do not use the Y adapters in the immediate vicinity of the inverter. The adapters must not be visible or freely accessible.
- In order to interrupt the DC circuit, always disconnect the inverter as described in this document (see Section 10, page 86).

7.6.2 Assembling the DC Connectors

QUALIFIED PERSON

DANGER

Danger to life due to electric shock when live components or DC cables are touched

The DC cables connected to a battery or a PV module may be live. Touching live DC cables results in death or serious injury due to electric shock.

- Disconnect the product and battery from voltage sources and make sure it cannot be reconnected before working on the device.
- Observe all safety information of the battery manufacturer.
- Do not touch non-insulated parts or cables.
- Do not disconnect the DC connectors under load.
- Wear suitable personal protective equipment for all work on the product.

NOTICE

Destruction of the inverter due to overvoltage

If the open-circuit voltage of the PV modules exceeds the maximum input voltage of the inverter, the inverter can be destroyed due to overvoltage.

- If the open-circuit voltage of the PV modules exceeds the maximum input voltage of the inverter, do not connect any strings to the inverter and check the design of the PV system.

For connection to the inverter, all PV module connection cables must be fitted with the DC connectors provided. Assemble the DC connectors as described in the following. The procedure is identical for both connectors (+ and -). The graphics for the procedure are shown for only the positive connector as an example. Pay attention to the correct polarity when assembling the DC connectors. The DC connectors are marked with the symbols "+" and "-".

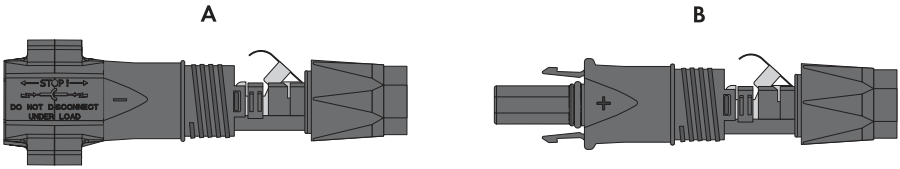


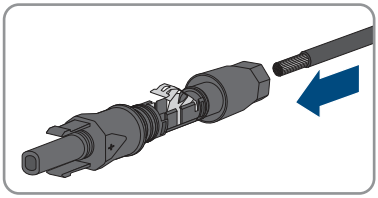
Figure 18: Negative (A) and positive (B) DC connectors

Cable requirements:

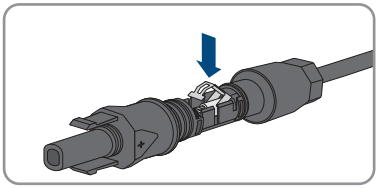
- ☐ External diameter: 5.5 mm to 8 mm
- ☐ Conductor cross-section: 2.5 mm² to 6 mm²
- ☐ Qty single wires: minimum 7
- ☐ Nominal voltage: minimum 1000 V
- ☐ Using bootlace ferrules is not allowed.

Procedure:

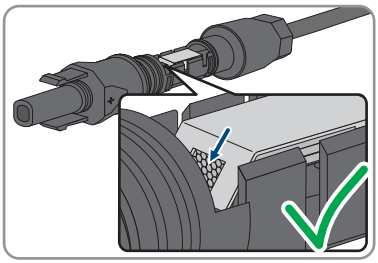
1. Strip approx. 15 mm of the cable insulation.
2. Insert the stripped cable into the DC connector up to the stop. When doing so, ensure that the stripped cable and the DC connector are of the same polarity.



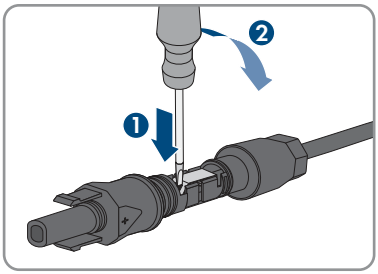
3. Press the clamping bracket down until it audibly snaps into place.



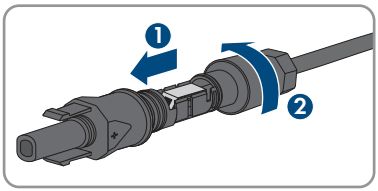
☑ The stranded wire can be seen inside the clamping bracket chamber.



4. If the stranded wire is not visible in the chamber, the cable is not correctly inserted and the connector must be reassembled. To do this, the cable must be removed from the connector.
   - Release the clamping bracket. To do so, insert a screwdriver (blade width: 3.5 mm) into the clamping bracket and pry the clamping bracket open.



   - Remove the cable and go back to step 2.



5. Push the swivel nut up to the thread and tighten (torque: 2 Nm).

7.6.3 Connecting the PV Array

⚠ QUALIFIED PERSON

⚠ WARNING

Danger to life due to electric shock from destruction of the measuring device due to overvoltage

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

- Only use measuring devices with a DC input voltage range of 1000 V or higher.

NOTICE

Destruction of the inverter due to overvoltage

If the open-circuit voltage of the PV modules exceeds the maximum input voltage of the inverter, the inverter can be destroyed due to overvoltage.

- If the open-circuit voltage of the PV modules exceeds the maximum input voltage of the inverter, do not connect any strings to the inverter and check the design of the PV system.

NOTICE

Damage to the DC connectors due to the use of contact cleaner of other cleaning agents

Some contact cleaners or other cleaning agents may contain substances that decompose the plastic of the DC connectors.

- Do not use contact cleaners or other cleaning agents for cleaning the DC connectors.

NOTICE

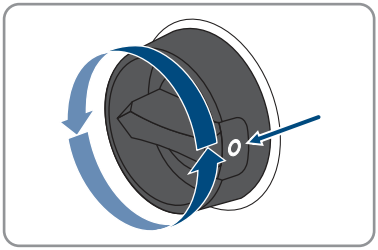
Damage to the product due to ground fault on DC side during operation

Due to the transformerless topology of the product, the occurrence of ground faults on DC side during operation can lead to irreparable damage. Damages to the product due to a faulty or damaged DC installation are not covered by warranty. The product is equipped with a protective device that checks whether a ground fault is present during the starting sequence. The product is not protected during operation.

- Ensure that the DC installation is carried out correctly and no ground fault occurs during operation.

Procedure:

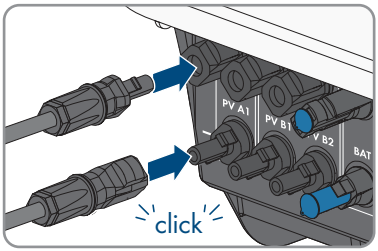
1. Disconnect the AC and backup miniature circuit breaker from all 3 line conductors and secure against reconnection.
2. If an external DC load-break switch is installed, disconnect the external DC load-break switch from all voltage sources.
3. Turn the DC load-break switch of the inverter to position **O**.



4. Ensure that the battery is switched off.
5. Measuring the voltage of the PV array. Ensure that the maximum input voltage of the inverter is adhered to and that there is no ground fault in the PV system.

6. Check whether the DC connectors have the correct polarity.

   If the DC connector is equipped with a DC cable of the wrong polarity, the DC connector must be reassembled. The DC cable must always have the same polarity as the DC connector.
7. Ensure that the whole open-circuit voltage of the PV array does not exceed the maximum input voltage of the inverter.
8. Connect the assembled DC connectors to the inverter.

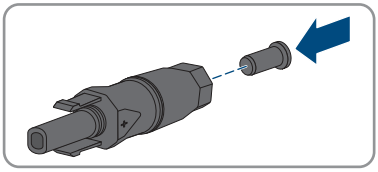


   ☑ The DC connectors snap into place.
9. Ensure that all DC connectors are securely in place.
10. **NOTICE**

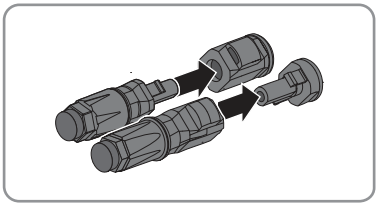
    Damage to the product due to sand, dust and moisture ingress if the DC inputs are not closed

    The product is only properly sealed when all unused DC inputs are closed with DC connectors and sealing plugs. Sand, dust and moisture penetration can damage the product and impair its functionality.

    - Seal all unused DC inputs using the DC connectors and sealing plugs as described in the following. When doing so, do not plug the sealing plugs directly into the DC inputs on the inverter.
11. For unused DC connectors, push down the clamping bracket and push the swivel nut up to the thread.
12. Insert the sealing plug into the DC plug connector.



13. Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.



   ☑ The DC connectors snap into place.
14. Ensure that the DC connectors with sealing plugs are securely in place.

7.6.4 Disassembling the DC Connectors

⚠ QUALIFIED PERSON

To disassemble the DC connectors for connection to the pv modules (e.g. due to faulty assembly), proceed as follows.

⚠ DANGER

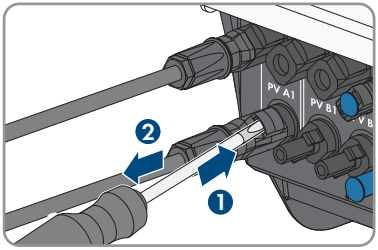
Danger to life due to electric shock when touching exposed DC conductors or DC plug contacts if the DC connectors are damaged or loose

The DC connectors can break or become damaged, become free of the DC cables, or no longer be connected correctly if the DC connectors are released and disconnected incorrectly. This can result in the DC conductors or DC plug contacts being exposed. Touching live DC conductors or DC plug connectors will result in death or serious injury due to electric shock.

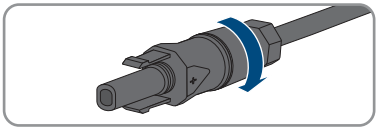
- Wear insulated gloves and use insulated tools when working on the DC connectors.
- Ensure that the DC connectors are in perfect condition and that none of the DC conductors or DC plug contacts are exposed.
- Carefully release and remove the DC connectors as described in the following.

Procedure:

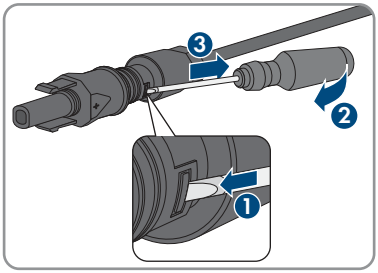
1. Release and remove the DC connectors. To do so, insert a flat-blade screwdriver or an angled screwdriver (blade width: 3.5 mm) into one of the side slots and pull the DC connectors out. When doing so, do not lever the DC connectors out, but insert the tool into one of the side slots only to release the locking mechanism, and do not pull on the cable.



2. Remove the DC connector swivel nut.

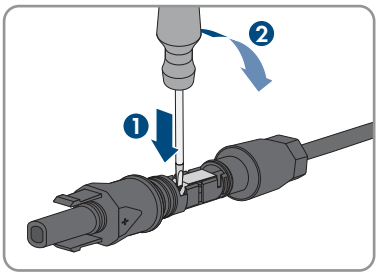


3. Unlock the DC connector. To do this, insert a flat-blade screwdriver (blade width: 3.5 mm) into the side catch mechanism and pry the catch mechanism open.



4. Carefully pull the DC connector apart.

5. Release the clamping bracket. To do so, insert a flat-blade screwdriver (blade width: 3.5 mm) into the clamping bracket and pry the clamping bracket open.



6. Remove the cable.

7.7 Connecting the power cable of the battery

⚠ QUALIFIED PERSON

NOTICE

Damage to the DC connectors due to the use of contact cleaner of other cleaning agents

Some contact cleaners or other cleaning agents may contain substances that decompose the plastic of the DC connectors.

- Do not use contact cleaners or other cleaning agents for cleaning the DC connectors.

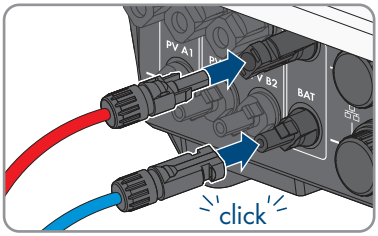
Requirements:

☐ Only use the supplied battery connection cables with DC connectors. Alternatively, MC4 connectors from Stäubli can be used with battery connection cables with a cross-section of 6 mm².

☐ The system must be designed for battery connection cables with a length of 3 m. If this is not possible, the battery connection cable can be extended. Only cables with a cross-section of 6 mm² and Sunclix connectors may be used for this purpose.

Procedure:

1. Connect the DC connectors to the inverter.



☑ The DC connectors snap into place.

2. Tighten the swivel nuts of the DC connectors to ensure strain relief of the DC cables and compliance with the degree of protection.
3. Ensure that all DC connectors are securely in place.

8 Commissioning

8.1 Commissioning Procedure

⚠ QUALIFIED PERSON

This section describes the commissioning procedure and gives an overview of the steps you must perform in the prescribed order.

i Carry out the commissioning procedure as described in the enclosure

If your product was supplied with a supplementary sheet in addition to the quick reference guide, perform commissioning according to the description in the supplementary sheet.

- Perform a firmware update before commissioning the product. You can find the update file and the manual on performing the update at the link on the supplementary sheet.

i Commissioning an inverter that is captured in a communication device

When the inverter is captured in a communication device, the communication device (e.g. Sunny Home Manager) is the unit for configuring the total system. The configuration is transferred to all inverters in the system. The system password assigned via the communication device is also the password for the user interface of the inverter.

- Commission the inverter (see Section 8.2, page 63).
- The initial configuration of the inverter is made via the communication device. The configuration is transferred to the inverter and the settings of the inverter are overwritten.
- Deactivate the Webconnect function of the inverter via the Sunny Portal. This prevents unnecessary connection attempts of the inverter with Sunny Portal.

Procedure		See
1.	Commission the inverter.	Section 8.2, page 63
2.	Establish a connection to the user interface of the inverter. There are various connection options to choose from for this: • Direct connection via WLAN • Direct connection via Ethernet • Connection via WLAN in the local network • Connection via Ethernet in the local network	Section 9.1, page 66
3.	Log into the user interface.	Section 9.2, page 69
4.	Select the inverter configuration option.	Section 8.3, page 63
5.	Configure the product and set country data set. Then the product will begin operation.	Section 9.10, page 77
6.	Make further inverter settings as needed.	Section 9, page 66

8.2 Commissioning the Inverter

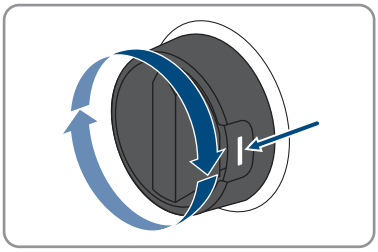
⚠ QUALIFIED PERSON

Requirements:

- ☐ The AC circuit breaker must be correctly rated and mounted.
- ☐ The product must be correctly mounted.
- ☐ All cables must be correctly connected.
- ☐ The Wi-Fi antenna must be mounted.
- ☐ The battery must be commissioned and the latest firmware must be installed (see battery manufacturer's documentation).

Procedure:

1. Switch on the AC circuit breaker.
2. Switch on the battery or the load-break switch of the battery (see documentation of the battery manufacturer).
3. Turn the DC load-break switch of the inverter to position **I**.



   - ☑ After 1 to 2 minutes, all 3 LEDs light up. The start-up phase begins.
   - ☑ All 3 LEDs go out again after approximately 90 seconds.
   - ☑ The green LED starts to flash and, if the inverter is connected via Speedwire, the blue LED also starts to flash.
4. If the green and red LEDs flash simultaneously during initial commissioning, operation is stopped because no country data set has been set yet. For the inverter to begin operation, the configuration must be completed and a country data set must be set.
5. If the green LED is still flashing, the conditions for activating feed-in operation are not yet met. As soon as the conditions for feed-in operation are met, the inverter starts with the feed-in operation and the green LED will light up continuously.
6. If the red LED lights up, an event has occurred. Find out which event has occurred and, if necessary, initiate countermeasures.

8.3 Selecting a configuration option

⚠ QUALIFIED PERSON

After you have assigned the password for the user groups **Installer** and **User** and logged in as **Installer**, the **Configuring the Inverter** page opens.

No Grid Guard code is required to configure this product.

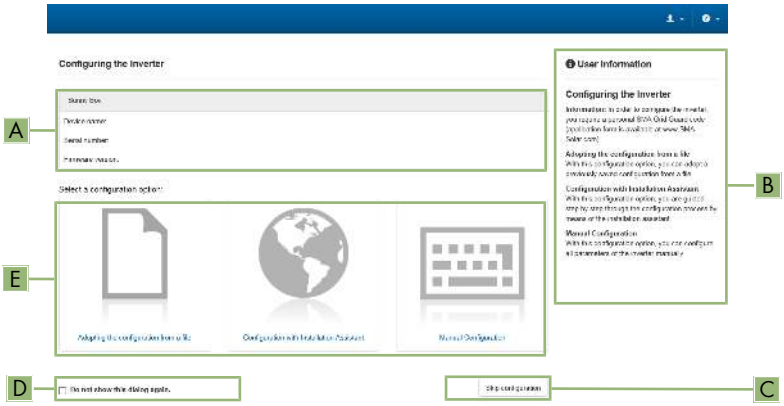


Figure 19: Layout of the **Configuring the Inverter** page

Position	Designation	Description
A	Device information	Provides the following information: • Device name • Inverter serial number • Inverter firmware version
B	User information	Provides brief information on the listed configuration options
C	Skip configuration	Offers the option of skipping the inverter configuration and go directly to the user interface (not recommended)
D	Checkbox	Allows you to choose not to have the displayed page displayed again when the user interface is called up again
E	Configuration options	Provides a selection of the various configuration options

Configuration options:

On the **Configuring the Inverter** page, different configuration options are available to choose from. Select one of the options and proceed for the selected option as described below. SMA Solar Technology AG recommends carrying out the configuration with the installation assistant. This way, you ensure that all relevant parameters are set for optimal inverter operation.

- Adoption of configuration from a file
- Configuration with the installation assistant (recommended)
- Manual configuration

Adopting the Configuration from a File

You can adopt the inverter configuration from a file. To do this, there must be an inverter configuration saved to a file.

Procedure:

1. Select the configuration option **Adopting configuration from a file**.
2. Select [**Browse...**] and select the desired file.
3. Select [**Import file**].

Configuring the Installation Assistant (Recommended)

1. Select the configuration option **Configuration with Installation Assistant**.
   ☑ The installation assistant will open.
2. Follow the installation assistant steps and make the settings appropriate for your system.
3. For every setting made in a step, select [**Save and next**].
   ☑ In the last step, all made settings are listed in a summary.
4. To correct settings you made, select [**Back**], navigate to the desired step, correct settings and select [**Save and continue**].
5. Once all settings are correct, select [**Next**] in the summary.
6. To save the settings to a file, select [**Export a summary**] and save the file on your smart device.
7. To export all parameters and their settings, select [**Export all parameters**]. This exports all parameters and their settings into an HTML file.

☑ The start page of the user interface opens.

Manual configuration

You can configure the inverter manually by setting the desired parameters.

Procedure:

1. Select the configuration option **Manual Configuration**.
   ☑ The **Device Parameters** menu on the user interface will open and all available parameter groups of the inverter will be displayed.
2. Select [**Edit parameters**].
3. Select the desired parameter group.
   ☑ All available parameters of the parameter group will be displayed.
4. Set the desired parameters.
5. Select [**Save all**].

☑ The inverter parameters are set.

9 Operation

9.1 Establishing a connection to the user interface

9.1.1 Establishing a Direct Connection via Ethernet

Requirements:

- ☐ The product must be commissioned.
- ☐ A smart device (e.g. laptop) with an Ethernet interface must be available.
- ☐ The product must be connected directly to the smart device.
- ☐ The respective latest version of one of the following web browsers must be installed on the smart device: Chrome, Edge, Firefox or Safari.

IP address of the inverter

- Standard inverter IP address for the direct connection via Ethernet: **169.254.12.3**

Procedure:

1. Open the web browser of your smart device and enter the IP address **169.254.12.3** in the address bar.
2. **Web browser signals a security vulnerability**
   After the IP address has been entered, a message might appear indicating that the connection to the user interface of the product is not secure. SMA Solar Technology AG guarantees the security of the user interface.
   - Continue loading the user interface.

☑ The login page of the user interface opens.

9.1.2 Establishing a direct connection via WLAN

You have several options to connect the product to a smart device. The procedure can be different depending on the devices. If the procedures described do not apply to your device, establish the direct connection via Wi-Fi as described in the manual of your device.

The following connection options ar available:

- Connection to SMA 360° App
- Connection with Wi-Fi network search

Requirements:

- ☐ The product must be commissioned.
- ☐ A smart device (e.g. smartphone, tablet or laptop) must be available.
- ☐ The respective latest version of one of the following web browsers must be installed on the smart device: Chrome, Edge, Firefox or Safari.
- ☐ JavaScript must be enabled in the web browser of the smart device.

SSID, IP address and WLAN password

- SSID in WLAN: **SMA[serial number]** (e.g. SMA0123456789)
- Device-specific WLAN password: see WPA2-PSK on the type label of the product or the rear side of the manual included in delivery
- Standard access address for a direct connection via WLAN outside of a local network: **https://smalogin.net** or **192.168.12.3**

Connection to SMA 360° App

Requirements:

☐ A smart device with camera (e.g. smartphone or tablet) must be available.

☐ The SMA 360° App must be installed on the smart device.

☐ An user account for Sunny Portal must already exist.

Procedure:

1. Open the SMA 360° App and login with the Sunny Portal account details.
2. Select **QR-Code Scan** in the menu.
3. Scan the QR Code on you product via the SMA 360° App.
   ☑ The smart device automatically connects to the product. The web browser of your smart device opens and the login page of the user interface is displayed.
4. If the web browser of the smart end device does not open automatically and the login page of the user interface is not displayed, open the web browser and enter **https://smalogin.net** in the address bar.

9.1.3 Establishing a Connection via Ethernet in the local network

New IP address for connecting with a local network

If the product is connected to a local network (e.g. via a router), the product will receive a new IP address. Depending on the type of configuration, the new IP address will be assigned automatically by the DHCP server (router) or manually by you. Upon completion of the configuration, the product can only be reached via the following access addresses:

- Generally applicable access address: IP address manually assigned or assigned by the DHCP server (router) (identification via network scanner software or network configuration of the router).
- Access address for Apple and Linux systems: **SMA[serial number].local** (e.g. SMA0123456789.local)
- Access address for Windows and Android systems: **https://SMA[serial number]** (e.g. https://SMA0123456789)

Requirements:

☐ The product must be connected to the local network via a network cable (e.g. via a router).

☐ The product must be integrated into the local network. Tip: There are various methods of integrating the product into the local network with the aid of the installation assistant.

- ☐ A smart device (e.g. smartphone, tablet or laptop) must be available.
- ☐ The smart device must be in the same local network as the product.
- ☐ The respective latest version of one of the following web browsers must be installed on the smart device: Chrome, Edge, Firefox or Safari.

Procedure:

1. Open the web browser of your smart device. Enter the IP address of the product in the address bar of the web browser.
2. **Web browser signals a security vulnerability**

   After the IP address has been entered, a message might appear indicating that the connection to the user interface of the product is not secure. SMA Solar Technology AG guarantees the security of the user interface.

   - Continue loading the user interface.

☑ The login page of the user interface opens.

9.1.4 Establishing a Connection via WLAN in the Local Network

New IP address for connecting with a local network

If the product is connected to a local network (e.g. via a router), the product will receive a new IP address. Depending on the type of configuration, the new IP address will be assigned automatically by the DHCP server (router) or manually by you. Upon completion of the configuration, the product can only be reached via the following access addresses:

- Generally applicable access address: IP address manually assigned or assigned by the DHCP server (router) (identification via network scanner software or network configuration of the router).
- Access address for Apple and Linux systems: **SMA[serial number].local** (e.g. SMA0123456789.local)
- Access address for Windows and Android systems: **https://SMA[serial number]** (e.g. https://SMA0123456789)

Requirements:

- ☐ The product must be commissioned.
- ☐ The product must be integrated into the local network. Tip: There are various methods of integrating the product into the local network with the aid of the installation assistant.
- ☐ A smart device (e.g. smartphone, tablet or laptop) must be available.
- ☐ The smart device must be in the same local network as the product.
- ☐ The respective latest version of one of the following web browsers must be installed on the smart device: Chrome, Edge, Firefox or Safari.

Procedure:

- Enter the IP address of the product in the address bar of the web browser.

  ☑ The login page of the user interface opens.

9.2 Logging In and Out of the User Interface

After a connection to the user interface of the inverter has been established, the login page opens. Log onto the user interface as described below.

Usage of cookies

For the correct display of the user interface, cookies are required. The cookies are used for convenience only. By using this user interface you agree to the placement of cookies.

Log in as Installer or User for the First Time

Password assignment for user and installer

The passwords for the user groups **Installer** and **User** must be assigned when accessing the user interface for the first time. If the inverter was registered in a communication device (e.g., Sunny Home Manager) and the system password was assigned, the system password is also the installer password. In this case, only the user password must be assigned.

- If you as a specialist assign the user password, only pass the password on to persons to access the inverter data via the user interface.
- If you as a user assign the installer password, only pass the password on to persons to receive access to the system.

Installer password for inverters registered in a communication device or in Sunny Portal

To be able to register the inverter in a communication device (e.g., Sunny Home Manager) or in a Sunny Portal system, the password for the user group **Installer** must match the system password. If you assign a password for the user group **Installer** via the user interface of the inverter, the same password must also be used as the system password.

- Assign a uniform installer password to all SMA devices in the system.

Procedure:

1. In the drop-down list **Language**, select the desired language.
2. In the **Password** field, enter a password for the **User** user group.
3. In the **Repeat password** field, enter the password again.
4. Click on **Save**.
5. In the **New password** field, enter a password for the **Installer** user group. Assign a uniform password to all SMA devices to be registered in a system. The installer password is also the system password.
6. In the **Repeat password** field, enter the password again.
7. Click on **Save and log in**.

☑ The **Configuring the Inverter** page opens.

Log in as the User or Installer

1. In the drop-down list **Language**, select the desired language.
2. In the **User group** drop-down list, select the entry **Installer** or **User**.

3. Enter the password in the field **Password**.
4. Select **Login**.

☑ The start page of the user interface opens.

Log Out as the User or Installer

1. On the right-hand side of the menu bar, select the menu **User Settings**.
2. In the subsequent context menu, select [**Logout**].

☑ The login page of the user interface opens. The logout was successful.

9.3 Start Page Design of the User Interface

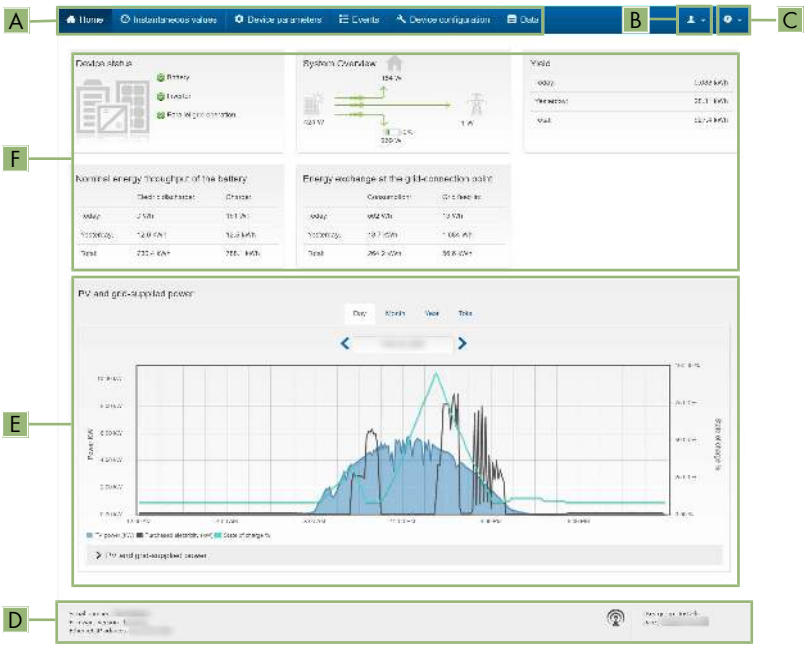


Figure 20: Design of the user interface's home page (example)

Position	Designation	Description
A	Menu	Provides the following functions: • **Home** Opens the user interface homepage • **Instantaneous values** Current measured values of the inverter • **Device Parameters** The various operating parameters of the inverter can be viewed and configured here depending on the user group. • **Events** All events that have occurred in the selected time period are displayed here. The event types are **Information**, **Warning** and **Error**. Currently existing events of the types **Error** and **Warning** will be additionally displayed in the **Device status** viewlet. However, only the higher-priority event is displayed. If, for example, there is a Warning and an Error present at the same time, only the Error will be displayed. • **Device configuration** Various settings for the inverter can be made here. The selection available is dependent on which user group you are logged in as and the operating system of the device with which the user interface has been called up. • **Data** You will find all data that is saved in the internal memory of the inverter or on an external storage medium on this page.
B	User settings	Provides the following functions, depending on the user group logged in: • Starting the installation assistant • Activating and Deactivating the Smart Inverter Screen • Logout
C	Help	Provides the following functions: • Displaying information on Open Source licenses used • Link to the website of SMA Solar Technology AG

Position	Designation	Description
D	Status bar	Displays the following information: • Inverter serial number • Inverter firmware version • IP address of the inverter within the local network and/or IP address of the inverter during WLAN connection • With WLAN connection: Signal strength of WLAN connection • User group logged in • Date and device time of the inverter
E	Current power and current consumption	Temporal progression of the PV power and the power consumption of the household over the selected time period. Please note, the power consumption will only be displayed if an energy meter is installed in the PV system.
F	Status display	The various areas display information on the current status of the system. • **Device status** Displays whether the inverter is currently in a fault-free operating state or whether there is an Error or Warning present. • **System overview** Shows the current power flows between the components of the system. • **Yield** Displays the energy yield of the inverter. • **Nominal energy throughput of the battery** Indicates how much energy has been charged to the battery and how much has been discharged from the battery. • **Energy exchange at the grid-connection point** Indicates which power is currently fed in or obtained at the grid-connection point.

9.4 Displaying and Downloading the Stored Data

When a smart device is connected to the product via LAN or Wi-Fi, you can view and download the stored data.

Procedure:

1. Open the user interface (see Section 9.1, page 66).
2. Log into the user interface (see Section 9.2, page 69).

3. Select the menu **Data**.
4. Select the folder **Data**.
5. To call up the data, select the respective folder and click on the required file.
6. To download the data, select the data type to be exported in the drop-down list. Then apply the time filter and select **Data export**.

9.5 Activating the Smart Inverter Screen

With the Smart Inverter Screen, the most important inverter data is displayed directly on the user interface login page. To activate the Smart Inverter Screen, proceed as listed in the following.

Procedure:

1. Activate the user interface (see Section 9.1, page 66).
2. Log in as **Installer** or **User**.
3. Select the menu **User Settings** (see Section 9.3, page 71) on the start page of the user interface.
4. Select [**Smart Inverter Screen**].

☑ The Smart Inverter Screen has been activated.

9.6 Starting the Installation Assistant

⚠ QUALIFIED PERSON

The installation assistant leads you step-by-step through the steps necessary for the initial configuration of the inverter.

Layout of the installation assistant

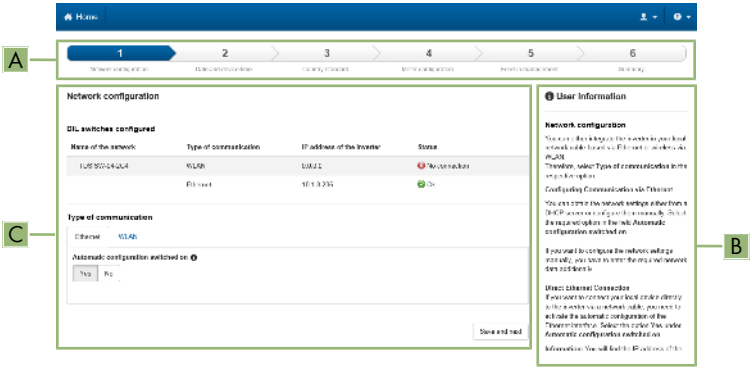


Figure 21: Layout of the installation assistant (example)

Position	Designation	Description
A	Configuration steps	Overview of the installation assistant steps. The number of steps depends on the type of device and the additionally installed modules. The current step is highlighted in blue.
B	User information	Information about the current configuration step and the setting options of the configuration step.
C	Configuration field	You can make settings in this field.

Procedure:

1. Open the user interface (see Section 9.1, page 66).
2. Log in as **Installer**.
3. Select the menu **User Settings** (see Section 9.3, page 71) on the start page of the user interface.
4. In the context menu, select [**Starting the installation assistant**].

☑ The installation assistant will open.

9.7 Switching WLAN On and Off

The inverter is equipped with an activated WLAN interface as standard. If you do not want to use WLAN, you can switch the WLAN function off and switch it on again whenever needed. In doing so, you can switch the WLAN direct connection and the WLAN connection in the local network on independently of each other.

Switching on the WLAN function only possible via Ethernet connection

If you switch off both the WLAN function for the direct connection and for the connection in the local network, access to the inverter user interface and therefore reactivation of the WLAN interface is only possible via an Ethernet connection.

The basic procedure for changing operating parameters is explained in another section (see Section 9.9, page 76).

Switching WLAN Off

If you would like to switch the WLAN function off completely, you must switch off both the direct connection and the connection in the local network.

Procedure:

- To switch off the direct connection in the parameter group **PV system communication > WLAN**, select the parameter **Soft-access-point is turned on** and set this to **No**.
- To switch off the connection in the local network in the parameter group **PV system communication > WLAN**, select the parameter **WLAN is turned on** and set this to **No**.

Switching WLAN On

If you have switched the WLAN function for direct connection or for connection in the local network off, you can switch the WLAN function back on in accordance with the following procedure.

Requirement:

☐ If the WLAN function was previously switched off completely, the inverter must be connected to a computer or router via Ethernet.

Procedure:

- To switch on the WLAN direct connection, in the parameter group **PV system communication > WLAN**, select the parameter **Soft-access-point is turned on** and set this to **Yes**.
- To switch on the WLAN connection in the local network, in the parameter group **System communication > WLAN**, select the parameter **WLAN is turned on** and set this to **Yes**.

9.8 Changing the Password

The password for the product can be changed for both user groups. Furthermore, the user group **Installer** can change the password for the user group **User** as well as its own password.

Procedure:

1. Open the user interface (see Section 9.1, page 66).
2. Log into the user interface (see Section 9.2, page 69).
3. Call up the menu **Device parameters**.
4. Click on [**Edit parameters**].
5. In the parameter group **User Rights > Access Control** change the password of the desired user group.
6. Select [**Save all**] to save the changes.

9.9 Changing Operating Parameters

The operating parameters of the inverter are set to certain values by default. You can change the operating parameters to optimize the performance of the inverter.

This section describes the basic procedure for changing operating parameters. Always change operating parameters as described in this section.

Some function-sensitive parameters can only be viewed by qualified persons.

Requirements:

☐ Changes to grid-relevant parameters must be approved by the responsible grid operator.

☐ Modifications of factory-set parameters for the battery configuration must be approved by the battery manufacturer.

Procedure:

1. Open the user interface (see Section 9.1, page 66).
2. Log into the user interface (see Section 9.2, page 69).
3. Call up the menu **Device parameters**.
4. Click on [**Edit parameters**].
5. Expand the parameter group that contains the parameter which is to be configured.
6. Change the required parameters.
7. Select [**Save all**] to save the changes.

☑ The parameters are set.

9.10 Configuring the Country Data Set

⚠ QUALIFIED PERSON

For the product to begin operation, a country data set must be set (for instance via the installation assistant on the user interface of the product, or via a communication product). As long as no country data set is set, operation of the product will remain stopped. This state is signaled by the green and red LEDs flashing simultaneously. Once configuration of the product is completed, the product will start operating automatically.

The country data set provides basic standardized settings. The specific requirements of the grid operator must be checked and set by the qualified person at hand.

The basic procedure for changing operating parameters is explained in another section (see Section 9.9, page 76).

Procedure:

- In the parameter group **Grid monitoring > Grid monitoring** select the parameter **Set country standard** and set the required country data set.

9.11 Configuring the Active Power Mode

⚠ QUALIFIED PERSON

Starting the installation assistant

1. Open the user interface (see Section 9.1, page 66).
2. Log in as **Installer**.
3. Start the installation assistant (see Section 9.6, page 74).

4. Select [**Save and continue**] after each step up until the step **Grid management service**.
5. Make the settings as described in the following.

Make the settings for systems with external setpoint

1. In the tab **Active power mode** set the switch **Active power setpoint** to [**On**].
2. In the drop-down list **Operating mode active power setpoint**, select the entry **External setpoint**.
3. In the drop-down list **Fallback behavior**, select the entry **Apply fallback values**.
4. In the field **Fallback value of the maximum active power** enter the value to which the inverter is to limit its nominal power in case of a communication failure to the higher control unit at the end of the timeout time.
5. In the field **Timeout**, enter the time that the inverter is to wait before it limits its nominal power to the set fallback value.
6. If, in the event of a 0% or 0 W specification, the inverter is not permitted to feed small amounts of active power into the utility grid, select the entry **Yes** in the drop-down list **Grid disconnection for 0% active power setpoint**. This ensures that in the event of a 0% or 0 W specification, the inverter disconnects from the utility grid and does not feed in active power.

Make the settings for systems with manual setpoint

1. In the tab **Active power mode** set the switch **Grid connection point regulation** to [**On**].
2. Enter the total power of the PV array in the field **Nominal system power**.
3. In the drop-down list **Operating mode active power setting**, select whether active power limitation is to be performed via a fixed specification in percent or in watts.
4. In the field **Set active power limit**, enter the value to which the active power at the point of interconnection is to be limited. The value must be set to **0** for zero active power.
5. Set the **Active power setpoint** to [**On**].
6. Select the entry **Manual setpoint in %** or **Manual setpoint in W** for manual specification and enter the respective setpoint value.
7. If the inverter itself is to control active power at the point of interconnection, perform the following steps:
   - In the drop-down list **Operating mode active power setting**, select the entry **External setting**.
   - In the drop-down list **Fallback behavior**, select the entry **Apply fallback values**.
   - In the drop-down list **Grid disconnection for active power setpoint of 0%** select the entry **No**.

9.12 Set reactive and active power characteristic curves

9.12.1 Setting the Q(V) characteristic curve

The characteristic curve is preset according to country data set. You can make adjustments via parameter settings. Coordinate the configuration with your grid operator.

The basic procedure for changing operating parameters is explained in another section (see Section 9.9, page 76).

Procedure:

1. Set the parameter **Number of used interpolation points** in the parameter group **System and device control > Inverter > Reactive power mode > Q(V) characteristic curve > Characteristic curve**.
2. Set the values for the interpolation points.

9.12.2 Setting the P(V) characteristic curve

The characteristic curve is preset according to country data set. You can make adjustments via parameter settings. Coordinate the configuration with your grid operator.

The basic procedure for changing operating parameters is explained in another section (see Section 9.9, page 76).

Procedure:

1. Set the parameter **Number of used interpolation points** in the parameter group **System and device control > Inverter > Active power mode > Voltage-dependent active power adjustment P(V) > Characteristic curve**.
2. Set the values for the interpolation points.

9.12.3 Setting the P(f) characteristic curve

The characteristic curve is preset according to country data set. You can make adjustments via parameter settings. Coordinate the configuration with your grid operator.

The basic procedure for changing operating parameters is explained in another section (see Section 9.9, page 76).

Procedure:

1. Set the parameter **Number of used interpolation points** in the parameter group **System and device control > Inverter > Conf. of the grid integr. characteristic curves > Characteristic curve**.
2. Enter the values for the interpolation points in the parameter group **System and device control > Inverter > Conf. of the grid integr. characteristic curves > Interpolation points of the characteristic curve 3**.

9.13 Operating Modes of the Multifunction Relay

Operating mode of multi-function relay (Mlt.Op-Mode)	Description
Switching state Backup current (BckOpModActl)	The multifunction relay controls a display device (e.g. an indicator light) which signals whether the battery-backup operation is active.

Operating mode of multi-function relay (Mlt.Op-Mode)	Description
Fan control (FanCtl)	The multifunction relay controls an external fan, depending on the temperature of the inverter. If the temperature of the inverter rises above a limiting value defined by SMA, the fan starts automatically. If the temperature falls below the limiting value, the fan is switched off again.
Fault indication (FltInd)	The multifunction relay controls a display device (e.g. a warning light) which signals an error of the inverter.

9.14 Changing the Operating Mode of the Multifunction Relay

⚠ QUALIFIED PERSON

The multifunction relay is set to **OFF** by default. If you decide to use an available operating mode (see Section 9.13, page 79) and have established the correct electrical connection for this operating mode and the associated connection variant, you will have to change the operating mode of the multifunction relay and make other settings, if necessary.

The basic procedure for changing operating parameters is explained in another section (see Section 9.9, page 76).

Procedure:

1. Call up the menu **Device parameters**.
2. Click on [**Edit parameters**].
3. In the parameter group **Device > Multifunction relay > Operating mode** select the parameter **Operating mode of multifunction relay** or **Mlt.OpMode** and set the desired operating mode.
4. Select [**Save all**] to save the changes.

9.15 Configuring the Battery-Backup System

The battery-backup operation mode is deactivated by default. To supply connected battery-backup appliances in the event of a power outage, the battery-backup operation mode must be activated. In addition, it is possible to set what proportion of the battery charge is to be retained for battery-backup operation.

The basic procedure for changing operating parameters is explained in another section (see Section 9.9, page 76).

Procedure:

1. In the parameter group **Device > Operation**, select the parameter **Operating mode of the battery-backup system** and set it to **Automatic** so that the battery-backup operation is activated automatically in the event of a grid failure.
2. Set the parameter **Minimum width of backup power area** in the parameter group **Battery > Areas of application**. The value indicates the percentage of battery charge to be retained for battery-backup operation. This battery charge cannot be used in parallel grid operation. SMA Solar Technology AG recommends to set a value between 10 and 30.

9.16 Power Supply of Backup Loads in Parallel Grid Operation

In parallel grid operation, the backup loads can be supplied from the utility grid as long as the amperage and voltage of the backup loads' circuits are within the permitted range.

If the current exceeds 20 A, a Smart Connected message is sent in any case. If the current exceeds 22 A, the contactor between the backup loads and the utility grid is opened after a tripping time that depends on the level of the current. The contactor is then automatically tested. If the test is successful, the contactor is closed again and the backup loads can continue to be supplied from the utility grid.

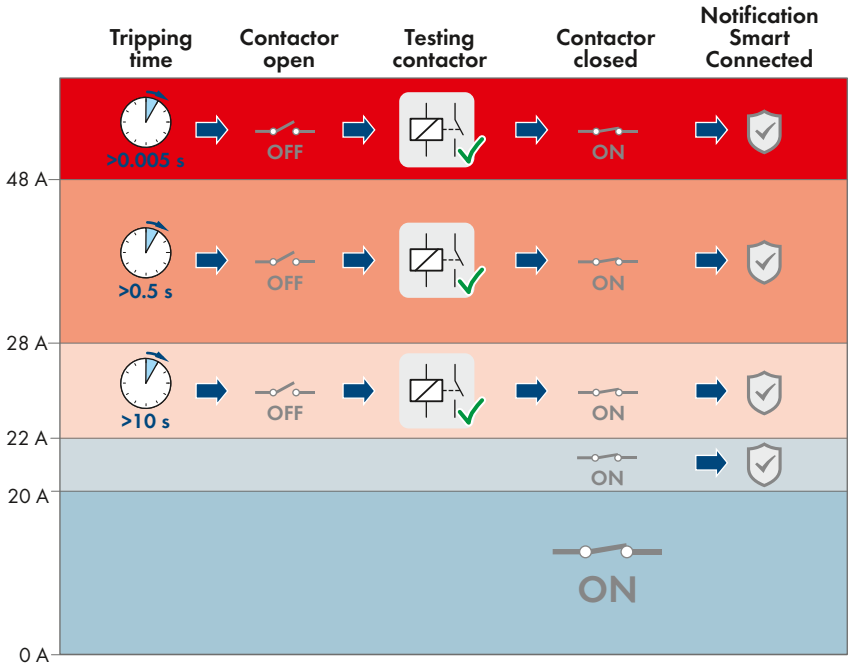


Figure 22: Behavior of the contactor between the AC backup terminal and the connection to the utility grid at increased current

If the voltage of the electrical circuits of the backup loads is not in the permitted range between 170 V and 277 V, the contactor opens. In order for the contactor to close again, the voltage must be in the permitted range for at least 20 s.

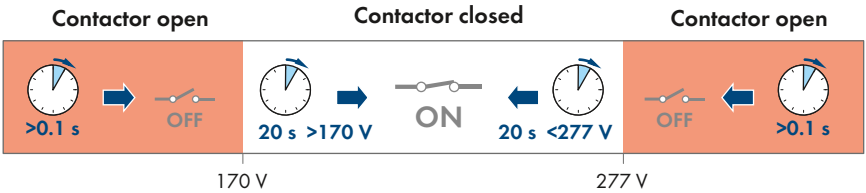


Figure 23: Behavior of the contactor between the AC backup terminal and the connection to the utility grid when the voltage is too high or too low

9.17 Configuring the Modbus Function

⚠ QUALIFIED PERSON

The Modbus interface is deactivated by default and the communication ports 502 set.

In order to access SMA inverters with SMA Modbus® or SunSpec® Modbus®, the Modbus interface must be enabled. After enabling the interface, the communication ports of both IP protocols can be changed. For information on commissioning and configuration of the Modbus interface, see the technical information "SMA and SunSpec Modbus® Interface" at www.SMA-Solar.com.

For information on which Modbus registers are supported, see the technical information "Modbus® parameters and measured values" at www.SMA-Solar.com.

i Measures for data security during activated Modbus interface

If you activate the Modbus interface, there is a risk that unauthorized users may access and manipulate the data or devices in your PV system.

To ensure data security, take appropriate protective measures such as:

- Set up a firewall.
- Close unnecessary network ports.
- Only enable remote access via VPN tunnel.
- Do not set up port forwarding at the communication port in use.
- In order to deactivate the Modbus interface, reset the inverter to the default settings or deactivate the activated parameter again.

Procedure:

- Activate the Modbus interface and adjust the communication ports if necessary (see the technical information "SMA and SunSpec Modbus® Interface" at www.SMA-Solar.com).

9.18 Setting SMA ShadeFix

⚠ QUALIFIED PERSON

You can set the time interval in which the inverter has to determine the optimum operating point. If you do not want to use SMA ShadeFix, you can disable the feature.

In battery-backup operation mode, SMA ShadeFix is automatically deactivated.

The basic procedure for changing operating parameters is explained in another section (see Section 9.9, page 76).

Procedure:

- In the parameter group **DC-side > DC settings > SMA ShadeFix**, set the parameter **Time interval of SMA ShadeFix** and set the required time interval. The ideal time interval is usually 6 minutes. This value should only be increased if the shading situation changes extremely slowly.
  - ☑ The inverter optimizes the MPP of the PV system at the predetermined time interval.
- In order to disable the SMA ShadeFix feature, in the parameter group **DC-side > DC settings > SMA ShadeFix**, set the parameter **SMA ShadeFix switched on** to **Off**.

9.19 Saving the Configuration in a File

You can save the current configuration of the inverter in a file. You can use this file as a data backup for this inverter and then import this file into this inverter again or another inverter from the same type or device family to configure the inverter. When saving, only the device parameters will be saved, not any passwords.

Procedure:

1. Open the user interface (see Section 9.1, page 66).
2. Log into the user interface (see Section 9.2, page 69).
3. Select the menu **Device Configuration**.
4. Select [**Settings**].
5. In the context menu, select [**Saving the configuration in a file**].
6. Follow the instructions in the dialog.

9.20 Adopting a Configuration from a File

⚠ QUALIFIED PERSON

To configure the inverter, you can adopt the configuration from a file. To be able to do this, you must first save the configuration of another inverter from the same type or device family in a file (see Section 9.19, page 83). When saving, only the device parameters will be adopted, not any passwords.

Requirements:

☐ Changes to grid-relevant parameters must be approved by the responsible grid operator.

Procedure:

1. Open the user interface (see Section 9.1, page 66).
2. Log into the user interface as an **Installer** (see Section 9.2, page 69).
3. Select the menu **Device Configuration**.
4. Select [**Settings**].
5. In the context menu, select [**Adopting the configuration from a file**].
6. Follow the instructions in the dialog.

9.21 Activating Automatic Firmware Update

⚠ QUALIFIED PERSON

You can activate the automatic firmware update in the inverter or in the communication product.

If the automatic firmware update is activated in the inverter, the inverter searches for updates and carries out the update.

If the automatic firmware update is activated in the communication product, the communication product searches for updates for the inverter and carries out the update of the inverter. In this case, the automatic firmware update is deactivated by default in the inverter. This prevents multiple downloads of updates.

In this section we describe how to activate the automatic firmware update in the inverter. The procedure for activating the automatic firmware update for detected devices in the communication product can be found in the manual for the communication product.

The basic procedure for changing operating parameters is explained in another section (see Section 9.9, page 76).

Procedure:

- In the parameter group **Device > Update**, select the **Automatic Update** parameter and set to **Yes**.

9.22 Updating the Firmware

⚠ QUALIFIED PERSON

If no automatic update is set in the communication product (e.g. Sunny Home Manager) or in Sunny Portal, you have the option of carrying out a manual firmware update for the inverter.

You have the following options to update the firmware:

- Automatic Firmware Update (Recommended)
- Update the firmware with the existing update file via the user interface of the inverter.
- Search and install the firmware via the user interface of the inverter.

Update the firmware with the existing update file via the user interface of the inverter.

Requirements:

☐ An update file with the desired firmware of the product must be available. You can download the update file from the product page under www.SMA-Solar.com.

Procedure:

1. Open the user interface (see Section 9.1, page 66).
2. Log into the user interface as an **Installer** (see Section 9.2, page 69).
3. Select the menu **Device Configuration**.
4. In the product row, click on the gear icon and select **Update firmware**.
5. Select [**Browse**] and select the update file for the product.
6. Select **Update firmware**.
7. Follow the instructions in the dialog.
   ☑ The firmware update is installed. The installation takes about 15 minutes.
8. Open the user interface and check the events to see whether the firmware update has been completed successfully.

Searching and updating firmware via the user interface

Requirement:

☐ The inverter must be connected to the Internet.

Procedure:

1. Open the user interface (see Section 9.1, page 66).
2. Log into the user interface as an **Installer** (see Section 9.2, page 69).
3. Select the menu **Device Parameters**.
4. Click on [**Edit parameters**].
5. Go to **Device > Update**.
6. Select the parameter **Check for update and install it** and set it to **Execute**.
7. Click on [**Save all**].

☑ The firmware is updated in the background.

10 Disconnecting the Inverter from Voltage Sources

⚠ QUALIFIED PERSON

Prior to performing any work on the product, always disconnect it from all voltage sources as described in this section. Always adhere to the prescribed sequence.

⚠ WARNING

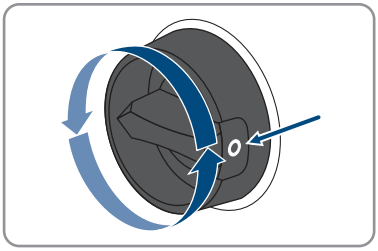
Danger to life due to electric shock from destruction of the measuring device due to overvoltage

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

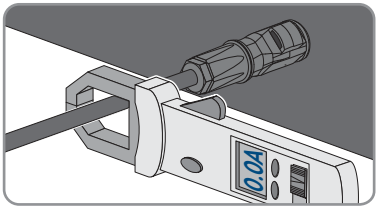
- Only use measuring devices with a DC input voltage range of 1000 V or higher.

Procedure:

1. Disconnect the AC and backup miniature circuit breaker from all 3 line conductors and secure against reconnection.
2. Set the DC load-break switch of the inverter to **O**.



3. Switch off the battery or the load-break switch of the battery (see documentation of the battery manufacturer).
4. Wait until the LEDs have gone out.
5. Wait 10 minutes. This will ensure that the capacitors are discharged.
6. Use a current clamp to ensure that no current is present in the DC cables.



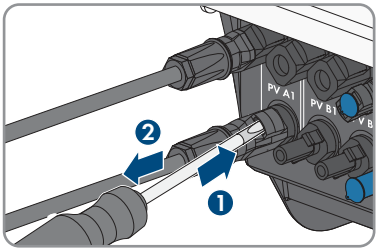
7. **⚠ DANGER**

Danger to life due to electric shock when touching exposed DC conductors or DC plug contacts if the DC connectors are damaged or loose

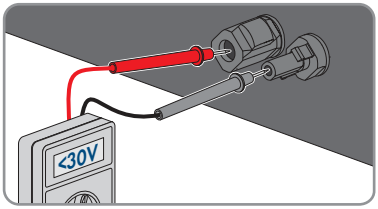
The DC connectors can break or become damaged, become free of the DC cables, or no longer be connected correctly if the DC connectors are released and disconnected incorrectly. This can result in the DC conductors or DC plug contacts being exposed. Touching live DC conductors or DC plug connectors will result in death or serious injury due to electric shock.

- Wear insulated gloves and use insulated tools when working on the DC connectors.
- Ensure that the DC connectors are in perfect condition and that none of the DC conductors or DC plug contacts are exposed.
- Carefully release and remove the DC connectors as described in the following.

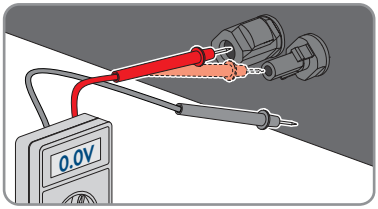
8. Release and remove the DC connectors. To do so, insert a flat-blade screwdriver or an angled screwdriver (blade width: 3.5 mm) into one of the side slots and pull the DC connectors out. When doing so, do not lever the DC connectors out, but insert the tool into one of the side slots only to release the locking mechanism, and do not pull on the cable.



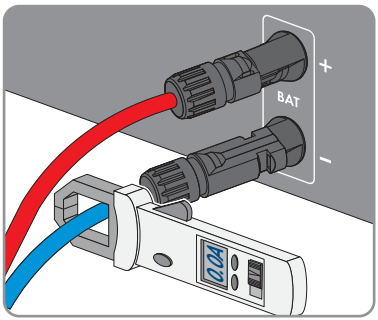
9. Ensure that no voltage is present between the positive terminal and negative terminal at the DC inputs using a suitable measuring device.



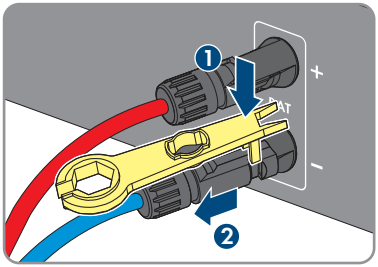
10. Ensure that no voltage is present between the positive terminal and ground as well as between the negative terminal and ground on the DC inputs using a suitable measuring device.



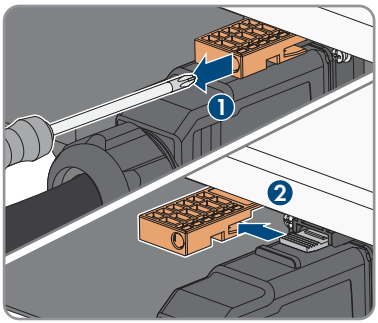
11. Ensure that no electric currents are present between the positive terminal and negative terminal at the battery inputs using a suitable measuring device.



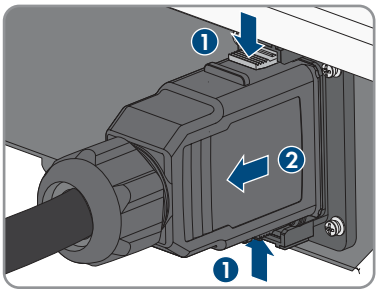
12. Insert an MC4 wrench (not included in the scope of delivery) into the notch of the DC connectors of the battery connection cables and pull slightly to remove the DC connectors.



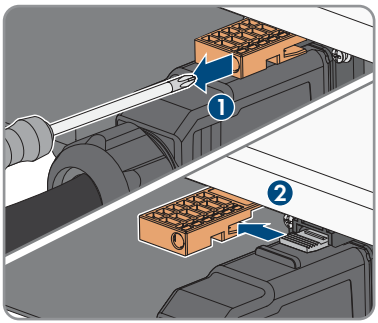
13. Ensure that the AC connectors for connection to the utility grid and for connection of the AC backup loads are marked so that they cannot be reversed when reconnected.
14. Remove the screw of the fuse terminal of the AC connector for connecting the AC backup loads (PH1) and slide the fuse terminal to the left.



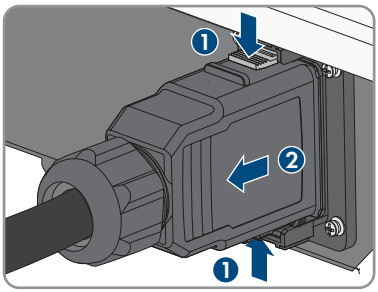
15. Squeeze the brackets on the top and bottom of the AC connector for connecting the AC backup loads and apply slight pressure. Pull the AC connector at the same time to remove the AC connector.



16. Remove the screw of the fuse terminal of the AC connector for connecting the utility grid (PH1) and slide the fuse terminal to the left.



17. Squeeze the tabs on the top and bottom of the AC connector for connecting the utility grid and apply slight pressure. Pull the AC connector at the same time to remove the AC connector.



11 Clean the product

NOTICE

Damage to the product due to cleaning agents

The use of cleaning agents may cause damage to the product and its components.

- Clean the product and all its components only with a cloth moistened with clear water.

Procedure:

- Ensure that the product is free of dust, foliage and other dirt.

12 Troubleshooting

12.1 Forgotten Password

Password assignment for inverters that are registered in a communication product

The password for the user group **Installer** is also the system password for the system in the communication product. Changing the password of the user group **Installer** can lead to the inverter no longer being able to be reached by the communication product.

- In the communication product, assign the changed password of the user group **Installer** as the new system password (see the manual of the communication product).

If you have forgotten the password for the inverter, you can unlock the inverter with a Personal Unlocking Key (PUK). For each inverter, there is 1 PUK for each user group (**User** and **Installer**). Tipp: With PV systems that are registered in a communication product, you can also assign a new password for the user group **Installer** via the communication product. The password for the user group **Installer** is the same as the system password in the communication product.

Procedure:

1. Request PUK (application form available at www.SMA-Solar.com).
2. Open the user interface (see Section 9.1, page 66).
3. Enter the PUK instead of the password into the field **Password**.
4. Select **Login**.
5. Call up the menu **Device parameters**.
6. Click on [**Edit parameters**].
7. In the parameter group **User Rights > Access Control** change the password of the desired user group.
8. Select [**Save all**] to save the changes.

12.2 Event Messages

Event number	Message, cause and corrective measures
101 102 103 104 105	⚠ QUALIFIED PERSON **Grid incident** The grid voltage or grid impedance at the connection point of the inverter is too high. The inverter has disconnected from the utility grid. **Corrective measures:** • Ensure that the correct country data set has been configured. • Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range. If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits. If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.
202 203 205 206	⚠ QUALIFIED PERSON **Grid incident** The utility grid has been disconnected, the AC cable is damaged or the grid voltage at the connection point of the inverter is too low. The inverter has disconnected from the utility grid. **Corrective measures:** • Ensure that the miniature circuit breaker is switched on. • Ensure that the AC cable is not damaged and that it is connected correctly. • Ensure that the country data set has been configured correctly. • Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range. If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits. If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.

Event number	Message, cause and corrective measures
501 502 503	⚠ QUALIFIED PERSON **Grid incident** The grid frequency is not within the permissible range. The inverter has disconnected from the utility grid. **Corrective measures:** • If possible, check the grid frequency and observe how often fluctuations occur. If fluctuations occur frequently and this message is displayed often, contact the grid operator and request approval to change the operating parameters of the inverter. If the grid operator gives his approval, discuss any changes to the operating parameters with the Service.
601	⚠ QUALIFIED PERSON **Grid incident** The inverter has detected an excessively high proportion of direct current in the grid current. **Corrective measures:** • Check the grid connection for direct current. • If this message is displayed frequently, contact the grid operator and check whether the monitoring threshold on the inverter can be raised.
901	⚠ QUALIFIED PERSON **Grounding connection missing > Check connection** The grounding conductor is not correctly connected. **Corrective measures:** • Ensure that the grounding conductor is correctly connected.
1302	⚠ QUALIFIED PERSON **Waiting for grid voltage > Installation failure grid connection > Check grid and fuses** L or N not connected. **Corrective measures:** • Ensure that L and N are connected. • Ensure that the miniature circuit breaker is switched on. • Ensure that the AC cable is not damaged and that it is connected correctly.

Event number	Message, cause and corrective measures
1416	⚠ QUALIFIED PERSON **Grid incident** Due to a voltage imbalance between the line conductors, the system disconnects from the utility grid. **Corrective measures:** • Eliminate any faults in the installation.
3401 3402 3403 3407 3410 3411 3412 3413 3414 3415 3416 3417 3418	⚠ QUALIFIED PERSON **DC overvoltage > Disconnect PV array** Overvoltage at the DC input. This can destroy the inverter. This message is signalized additionally by rapid flashing of the LEDs. **Corrective measures:** • **Immediately** disconnect the inverter from all voltage sources. • Check whether the DC voltage is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the DC connectors to the inverter. • If the DC voltage exceeds the maximum input voltage of the inverter, ensure that the PV array has been correctly rated or contact the installer of the PV array. • If this message is repeated frequently, contact Service.
3501 3503	⚠ QUALIFIED PERSON **Ground fault > Check PV array** The inverter has detected a ground fault in the PV array. **Corrective measures:** • Check the PV system for ground faults.
3601	⚠ QUALIFIED PERSON **High leakage current > Check PV array** The leakage current of the inverter and the battery is too high. There is a ground fault, a residual current or a malfunction. The inverter interrupts parallel grid operation immediately after exceeding a threshold. When the fault is eliminated, the inverter automatically reconnects to the utility grid. **Corrective measures:** • Check the battery and DC cabling for ground faults.

Event number	Message, cause and corrective measures
3800 3801 3802 3803 3804 3805	⚠ QUALIFIED PERSON **DC overcurrent > Check PV array** Overcurrent at the DC input. The inverter briefly interrupts feed-in operation. **Corrective measures:** • If this message is displayed frequently, ensure that the PV array has been correctly rated and wired.
3901 3902	⚠ QUALIFIED PERSON **Waiting for DC start conditions > Start conditions not met** The feed-in conditions for the utility grid are not yet fulfilled. **Corrective measures:** • Ensure that the PV array is not covered by snow or otherwise shaded. • Wait for higher irradiation. • If this message is displayed frequently in the morning, increase the voltage limit for starting grid feed-in. Change the parameter **Critical voltage to start feed-in**. • If this message is displayed frequently with medium irradiation, ensure that the PV array is correctly rated.
4013 4014	⚠ QUALIFIED PERSON **Reverse currents or input X polarity reversed > Check generator** The displayed input is in reverse polarity or reverse current has been detected in the input. **Corrective measures:** • Check the correct polarity of the connected PV modules. • Ensure correct design and circuitry of the PV array. • If solar irradiation is sufficient, check whether the same voltage is present at the DC inputs. • Ensure that no PV module is defective.
6155	⚠ QUALIFIED PERSON **Version test failed** Processor defective. **Corrective measures:** • Contact the Service.

Event number	Message, cause and corrective measures
6201 6202 6204 6304 6305 6306 6313 6404 6405 6406 6407 6408 6410 6414 6422 6437 6447 6454 6456 6460 6462 6463	⚠ QUALIFIED PERSON **Self-diagnosis > Device disturbance** The cause must be determined by the Service. **Corrective measures:** • Contact the Service.
6501 6502 6509	⚠ QUALIFIED PERSON **Self-diagnosis > Overtemperature** The inverter has switched off due to excessive temperature. **Corrective measures:** • Ensure that the airflow is free of dirt. • Ensure that the ambient temperature does not exceed the maximum permissible temperatures. • If the maximum permissible temperatures are met at all times and this message is displayed again, contact the Service.
6512	**Minimum operating temperature not reached** The inverter will only recommence grid feed-in once the temperature has reached at least −25 °C.

Event number	Message, cause and corrective measures
6513	⚠ QUALIFIED PERSON **Self-diagnosis > Overtemperature** The inverter has switched off due to excessive temperature. **Corrective measures:** • Ensure that the airflow is free of dirt. • Ensure that the ambient temperature does not exceed the maximum permissible temperatures. • If the maximum permissible temperatures are met at all times and this message is displayed again, contact the Service.
6603 6604	⚠ QUALIFIED PERSON **Self-diagnosis > Overload** The cause must be determined by the Service. **Corrective measures:** • Contact the Service.
6607 6608 6609 6610	⚠ QUALIFIED PERSON **Self-diagnosis > Battery overcurrent** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available and this message is displayed again, contact the Service.
6801 6802	⚠ QUALIFIED PERSON **Self-diagnosis > Input A defective** **Corrective measures:** • Check whether a string is connected to input A. • Contact the Service.
6901 6902	⚠ QUALIFIED PERSON **Self-diagnosis > Input B defective** **Corrective measures:** • Check whether a string is connected to input B. • Contact the Service.

Event number	Message, cause and corrective measures
6701 6702	⚠ QUALIFIED PERSON **Communication failure** Error in the communication processor, the inverter continues feeding in, however. The cause must be determined by the Service. **Corrective measures:** • If this message is displayed frequently, contact the Service.
7001 7002 7003 7007 7014	⚠ QUALIFIED PERSON **Sensor fault** Measurement error. **Corrective measures:** • Contact the Service.
7106	**Update file defective** The update file is defective. The update failed. The inverter continues to feed in.
7110	**No update file found** No new update file was found on the SD memory card. The update failed. The inverter continues to feed in.
7112	**Update file successfully copied**
7113	**The memory card is full or write-protected**
7201 7202	**Data stor. not poss.**
7303	⚠ QUALIFIED PERSON **Host computer update failed** The cause must be determined by the Service. **Corrective measures:** • Contact the Service.
7320	**The device was successfully updated** The firmware update was completed successfully.

Event number	Message, cause and corrective measures
7324	⚠ QUALIFIED PERSON **Wait for update conditions** The testing of the update conditions was not successful. The firmware update package is not suitable for this inverter. **Corrective measures:** • Retry update. • Ensure that the selected update file is suitable for this inverter. • If this message is displayed again, contact the Service.
7330	⚠ QUALIFIED PERSON **Condition test failed** **Corrective measures:** • Retry update. • Ensure that the selected update file is suitable for this inverter. • If this message is displayed again, contact the Service.
7333	⚠ QUALIFIED PERSON **Update transport failed** Update file could not be copied to the inverter's internal memory. In the event of connection with the inverter via Wi-Fi network, a poor connection quality can be the cause. **Corrective measures:** • Retry update. • For Wi-Fi connection: Improve the Wi-Fi connection quality (e.g. via Wi-Fi repeater) or establish connection with the inverter via Ethernet. • If this message is displayed again, contact the Service.
7337	⚠ QUALIFIED PERSON **Battery management system update unsuccessful (|d0|)** **Corrective measures:** • Retry update. • Ensure that the selected update file is suitable for this inverter and the battery. • If this message is displayed again, contact the Service.

Event number	Message, cause and corrective measures
7340	**Update communication failed** **Corrective measures:** • Retry update. • Ensure that the selected update file is suitable for this inverter. • If this message is displayed again, contact the Service.
7347	⚠ QUALIFIED PERSON **Incompatible file** The configuration file is not suitable for this inverter. **Corrective measures:** • Ensure that the selected configuration file is suitable for this inverter. • Retry import.
7348	⚠ QUALIFIED PERSON **Incorrect file format** The configuration file is not of the required format or is damaged. **Corrective measures:** • Ensure that the selected configuration file is of the required format and is not damaged. • Retry import.
7349	⚠ QUALIFIED PERSON **Incorrect login rights for configuration file** The user group logged in does not have the user rights necessary to be able to import a configuration. **Corrective measures:** • Log in as **Installer**. • Import configuration file again.
7350	**Transfer of a configuration file has started** The configuration file is being transferred.
7357	**Update BIM** The Battery Interface Module on the communication assembly has been successfully updated.

Event number	Message, cause and corrective measures
7358	⚠ QUALIFIED PERSON **Update BIM failed** The Battery Interface Module on the communication assembly has not been updated successfully. **Corrective measures:** • Retry update. • If this message is displayed again, contact the Service.
7359	**Update BUC** The SMA Backup Unit Controller that is installed in the automatic transfer switch has been updated successfully.
7360	⚠ QUALIFIED PERSON **Update BUC failed** **Corrective measures:** • Ensure that the communication between SMA Backup Unit Controller and the inverter functions perfectly. • Ensure that the cable requirements of the communication cable for the communication between the SMA Backup Unit Controller and the inverter have been met. • Retry update. • If this message is displayed again, contact the Service.
7361	**Update SMA Gateway Interface Module**
7362	⚠ QUALIFIED PERSON **Update SMA Gateway Interface Module failed** **Corrective measures:** • Retry update. • If this message is displayed again, contact the Service.
7363	**Update of PV module electronics**
7364	⚠ QUALIFIED PERSON **Update of PV module electronics not successful** **Corrective measures:** • Retry update. • If this message is displayed again, contact the Service.

Event number	Message, cause and corrective measures
7500	⚠ QUALIFIED PERSON **Sensor fault** Measurement error. **Corrective measures:** • Contact the Service.
7600	⚠ QUALIFIED PERSON **Self-diagnosis > Communication error** **Corrective measures:** • Contact the Service.
7613	⚠ QUALIFIED PERSON **Communication with meter faulty > Check communication to meter** Communication with an energy meter is faulty. **Corrective measures:** • Ensure that the data cables are correctly installed.
7619	⚠ QUALIFIED PERSON **Communication fault with meter unit > Check communication to meter** The inverter is not receiving any data from the energy meter. **Corrective measures:** • Ensure that the energy meter is correctly integrated into the same network as the inverter (see energy meter manual). • Connect the energy meter directly to the 2nd Ethernet port of the inverter. • For Wi-Fi connection: Improve the Wi-Fi connection quality (e.g., via Wi-Fi repeater) or connect the inverter with the DHCP server (router) via Ethernet.
7702 7712 7729 7802 7803	⚠ QUALIFIED PERSON **Self-diagnosis > Device disturbance** The cause must be determined by the Service. **Corrective measures:** • Contact the Service.
8101 8102 8103 8104	⚠ QUALIFIED PERSON **Communication failure** The cause must be determined by the Service. **Corrective measures:** • Contact the Service.

Event number	Message, cause and corrective measures
8903 8904 8905	⚠ QUALIFIED PERSON **Self-diagnosis > Device disturbance** The cause must be determined by the Service. **Corrective measures:** • Contact the Service.
9301	**New battery detected**
9307	⚠ QUALIFIED PERSON **Battery system defective** **Corrective measures:** • Contact the battery manufacturer.
9308	⚠ QUALIFIED PERSON **Communication error battery system** **Corrective measures:** • Carry out communication test. If the test was successful, contact the battery manufacturer. If the test was not successful, contact the Service (see Section 17, page 129).
9311	⚠ QUALIFIED PERSON **Battery cell overvoltage fault** **Corrective measures:** • Contact the battery manufacturer.
9312	⚠ QUALIFIED PERSON **Battery cell undervoltage fault** **Corrective measures:** • Contact the battery manufacturer.
9313	⚠ QUALIFIED PERSON **Battery low temperature fault** **Corrective measures:** • Contact the battery manufacturer.
9314	⚠ QUALIFIED PERSON **Battery overtemperature** **Corrective measures:** • Contact the battery manufacturer.

Event number	Message, cause and corrective measures
9315	⚠ QUALIFIED PERSON **Battery imbalancing fault** **Corrective measures:** • Contact the battery manufacturer.
9316	⚠ QUALIFIED PERSON **Internal battery hardware fault** **Corrective measures:** • Contact the battery manufacturer.
9334	**Battery charging test** The battery test for charging the battery is carried out.
9335	**Discharge battery test** The battery test for discharging the battery is carried out.
9336	⚠ QUALIFIED PERSON **Start conditions for battery test not fulfilled** The state of charge of the battery is too low or too high for carrying out the test. **Corrective measures:** • Perform the test that has not been performed yet.
9337	**Charge battery test successful**
9338	**Battery discharging test successful**
9339	⚠ QUALIFIED PERSON **Battery charging test failed** **Corrective measures:** • Check the installation of the battery. • Perform the test that has not been performed yet.
9340	⚠ QUALIFIED PERSON **Battery discharging test failed** **Corrective measures:** • Check the installation of the battery. • Perform the test that has not been performed yet.

Event number	Message, cause and corrective measures
9346	⚠ QUALIFIED PERSON **Battery not configured** **Corrective measures:** • Start the installation assistant on the inverter user interface and perform the battery configuration.
9347	⚠ QUALIFIED PERSON **Battery |b0| reports event: 0x|x5||x4|, 0x|x7||x6|, 0x|x9||x8|, 0x|xB||xA|** **Corrective measures:** • Contact the battery manufacturer.
9351	⚠ QUALIFIED PERSON **Incorrect switch position for the battery disconnection point** **Corrective measures:** • Contact the battery manufacturer.
9352	⚠ QUALIFIED PERSON **Battery system short circuit** **Corrective measures:** • Contact the battery manufacturer.
9370	⚠ QUALIFIED PERSON **Communication with the battery system is disrupted > Check battery connection** **Corrective measures:** • Check the installation of the battery. • Perform the test that has not been performed yet.
9385	⚠ QUALIFIED PERSON **Internal battery hardware fault** **Corrective measures:** • Contact the battery manufacturer.
9398	⚠ QUALIFIED PERSON **Battery overcurrent charge/discharge** **Corrective measures:** • Contact the battery manufacturer.
10108	**Time adjusted / old time**

Event number	Message, cause and corrective measures
10109	**Time adjusted / new time**
10110	⚠ QUALIFIED PERSON **Time synchronization failed: [tn0]** No time information could be called up from the set NTP server. **Corrective measures:** • Ensure that the NTP server was configured correctly. • Ensure that the inverter is integrated into a local network with Internet connection.
10118	**Parameter upload complete** The configuration file was loaded successfully.
10248	⚠ QUALIFIED PERSON **[Interface]: network busy** The network is busy. Data exchange between the devices is not at an optimum and is greatly delayed. **Corrective measures:** • Increase the query intervals. • If necessary, reduce the number of devices in the network.
10249	⚠ QUALIFIED PERSON **[Interface]: network overloaded** The network is overloaded. There is no data exchange between the devices. **Corrective measures:** • Reduce the number of devices in the network. • If necessary, increase the data query intervals.
10250	⚠ QUALIFIED PERSON **[Interface]: package error rate [ok / high]** The package error rate has changed. If the package error rate is high, the network is overloaded or the connection to the network switch or DHCP server (router) is impaired. **Corrective measures if the package error rate is high:** • Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. • If necessary, increase the data query intervals. • If necessary, reduce the number of devices in the network.

Event number	Message, cause and corrective measures
10251	**[Interface]: communication status goes to [OK / Warning / Error / Not connected]** The communication status to the network switch or DHCP server (router) has changed. An additional error message may be displayed.
10252	⚠ QUALIFIED PERSON **[Interface]: communication disrupted** There is no valid signal on the network line. **Corrective measures:** • Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. • Ensure that the DHCP server (router) and any network switches are signalizing correct operation.
10253	⚠ QUALIFIED PERSON **[Interface]: connection speed goes to [100 Mbit / 10 Mbit]** The data transfer rate has changed. The cause for the status [10 Mbit] can be a defective plug, a defective cable or the pulling or plugging of the network connector. **Corrective measures if the status is [10 Mbit]:** • Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. • Ensure that the DHCP server (router) and any network switches are signalizing correct operation.
10254	⚠ QUALIFIED PERSON **[Interface]: duplex mode goes to [Full / Half]** The duplex mode (data transfer mode) has changed. The cause for the status [Half] can be a defective plug, a defective cable or the pulling or plugging of the network connector. **Corrective measures if the status is [Half]:** • Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. • Ensure that the DHCP server (router) and any network switches are signalizing correct operation.

Event number	Message, cause and corrective measures
10255	⚠ QUALIFIED PERSON **[Interface]: Network load OK** The network load has returned to a normal range after being busy.
10270	**No communication with SHM > Check connection** The inverter is not receiving any data from the Sunny Home Manager. **Corrective measures:** • Ensure that the energy meter is correctly integrated into the same network as the inverter (see energy meter manual). • Connect the energy meter directly to the 2nd Ethernet port of the inverter. • For Wi-Fi connection: Improve the Wi-Fi connection quality (e.g., via Wi-Fi repeater) or connect the inverter with the DHCP server (router) via Ethernet.
10282	**[User group]-Login via [protocol] locked** After several incorrect login attempts, login has been blocked for a limited time. The user login will be locked for 15 minutes. **Corrective measures:** • Wait until the given time has expired and then retry login.
10283	⚠ QUALIFIED PERSON **Wi-Fi module faulty** The Wi-Fi module integrated in the inverter is defective. **Corrective measures:** • Contact the Service.
10284	⚠ QUALIFIED PERSON **No Wi-Fi connection possible** The inverter does not currently have a Wi-Fi connection to the selected network. **Corrective measures:** • Ensure that the SSID, the Wi-Fi password and the encryption method have been entered correctly. The encryption method is specified by your Wi-Fi router or Wi-Fi access point and can be changed there. • Ensure that the Wi-Fi router or Wi-Fi access point is in range and is signalizing correct operation. • If this message is displayed often, improve the Wi-Fi connection by using a Wi-Fi repeater.
10285	**Wi-Fi connection established** Connection to the selected Wi-Fi network has been established.

Event number	Message, cause and corrective measures
10286	⚠ QUALIFIED PERSON **Wi-Fi connection lost** The inverter has lost Wi-Fi connection to the selected network. **Corrective measures:** • Ensure that the Wi-Fi router or Wi-Fi access point is still active. • Ensure that the Wi-Fi router or Wi-Fi access point is in range and is signalizing correct operation. • If this message is displayed often, improve the Wi-Fi connection by using a Wi-Fi repeater.
10339	**Webconnect enabled** The Webconnect function has been enabled.
10340	**Webconnect disabled** The Webconnect function has been disabled.
10341	**Webconnect error: no connection** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10343	**Webconnect error: Default gateway not configured** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (e.g. DLAN, Wi-Fi access point). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)

Event number	Message, cause and corrective measures
10344	**Webconnect error: DNS server not configured** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10345	**No reply to DNS request** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10352	**Webconnect error: Faulty communication** It is likely that there is an error in the network settings or a Sunny Portal maintenance message is present. **Corrective measures:** • If a Sunny Portal maintenance message is present, wait until the maintenance has been completed. • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10420	**Self-consumption control was started**
10421	**Self-consumption control was stopped**
10517	**Dynamic active power limitation started.** The inverter limits the active power of the PV inverters to the set limit.
10518	**Dynamic active power limitation terminated.** The inverter terminated the active power limitation of the PV inverters.

Event number	Message, cause and corrective measures
10520	⚠ QUALIFIED PERSON **Supplied power: [xx] W (permitted value: [xx] W)** The set active power limitation cannot be met. **Corrective measures:** • Ensure that the correct active power limitation has been configured. • Ensure that the PV inverters have been configured correctly. • Ensure that the communication between battery inverter and PV inverter functions perfectly. • Ensure that no external feeders are in the system.
10521	**Active power was limited today for [xx] minutes.** The active power limitation of the PV inverters was limited for the specified time.
10525	**Inverter does not respond to active power limitation.**
10528	**Login for NSD function on device |s0| failed**
27107	**Update file OK** The update file found is valid.
27108	**Memory card is being read** The storage medium is being read.
27109	**No new update on the memory card** A new update file was not found on the storage medium.
27301	**Update communication** The inverter is updating the communication component.
27302	**Update main CPU** The inverter is updating the inverter component.
27312	**Update completed** The inverter has successfully completed the update.
27329	**Condition test successful** The testing of the update conditions was successful. The firmware update package is suitable for this inverter.
27331	**Update transport started** Update file is being copied.
27332	**Update transport successful** Update file was copied successfully to the inverter's internal memory.
27336	**Battery management system**

Event number	Message, cause and corrective measures
29004	**Grid parameter unchanged** Changing the grid parameters is not possible.
29006	**Self-test**
29253	⚠ QUALIFIED PERSON **Input power for backup too low** The input power is too low. The battery-backup operation cannot be started. As soon as the minimum input power for the battery-backup operation is reached, the battery-backup operation starts. **Corrective measures:** • Switch off or disconnect backup loads that are not required.
29255 29256	⚠ QUALIFIED PERSON **Overload in backup operation** The loads connected to the terminal for backup loads exceed the permissible current. **Corrective measures:** • Check electric circuits of backup loads and the loads connected. • Disconnect the loads from the electric circuit.

12.3 Checking the PV System for Ground Faults

⚠ QUALIFIED PERSON

If the red LED is glowing and the event number 3501, 3601 or 3701 is being displayed in the **Results** menu on the inverter user interface, there may be a ground fault present. The electrical insulation from the PV system to ground is defective or insufficient.

⚠ DANGER

Danger to life due to electric shock when touching live system components in case of a ground fault

If a ground fault occurs, parts of the system may still be live. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Disconnect the product and battery from voltage sources and make sure it cannot be reconnected before working on the device.
- Only touch the cables of the PV modules on their insulation.
- Do not touch any parts of the substructure or frame of the PV array.
- Do not connect PV strings with ground faults to the inverter.

⚠ WARNING

Danger to life due to electric shock from destruction of the measuring device due to overvoltage

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

- Only use measuring devices with a DC input voltage range of 1000 V or higher.

Procedure:

In order to check the PV system for ground faults, perform the following actions in the prescribed order. The exact procedure is described in the following sections.

- Check the PV system for ground faults by measuring the voltage.
- If the voltage measurement was not successful, check the PV system via insulation resistance measurement for ground faults.

Test by Measuring the Voltage

Proceed as follows to check each string in the PV system for ground faults.

Procedure:

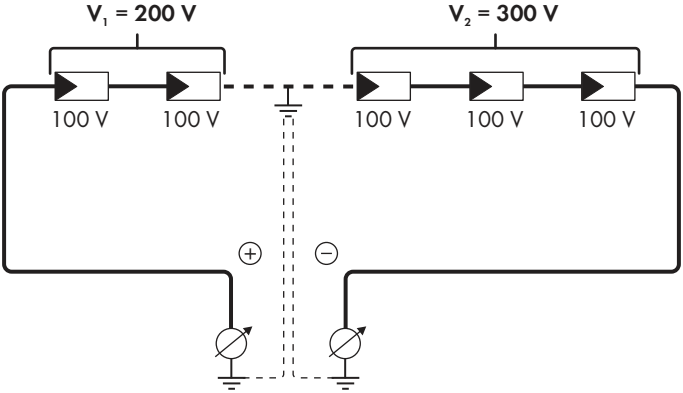
1. **⚠ DANGER**

   Danger to life due to high voltages

   - Disconnect the inverter from all voltage sources (see Section 10, page 86).
2. Measure the voltages:
   - Measure the voltage between the positive terminal and the ground potential (PE).
   - Measure the voltage between the negative terminal and the ground potential (PE).
   - Measure the voltage between the positive and negative terminals.
     If the following results are present at the same time, there is a ground fault in the PV system:
     - ☑ All measured voltages are stable.
     - ☑ The sum of the two voltages to ground potential is approximately equal to the voltage between the positive and negative terminals.
3. If a ground fault is present, determine the location of the ground fault via the ratio of the two measured voltages and eliminate the ground fault.
4. If a definite ground fault cannot be measured and the message is still displayed, measure the insulation resistance.
5. Reconnect the strings without ground faults to the inverter and recommission the inverter (see inverter installation inverter).

Location of the ground fault

The example shows a ground fault between the second and third PV module.



Test by Measuring the Insulation Resistance

If the voltage measurement does not provide sufficient evidence of a ground fault, the insulation resistance measurement can provide more exact results.

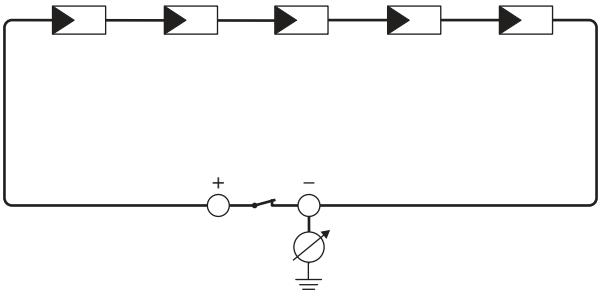


Figure 24: Schematic diagram of the measurement

Calculating the insulation resistance

The expected total resistance of the PV system or of an individual string can be calculated using the following formula:

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$$

The exact insulation resistance of a PV module can be obtained from the module manufacturer or the datasheet.

For the resistance of a PV module an average value can be assumed: for thin-film PV modules approximately 40 MOhm and for polycrystalline and monocrystalline PV modules approximately 50 MOhm per PV module (for further information on calculating the insulation resistance see the Technical Information "Insulation Resistance (Riso) of Non-Galvanically Isolated PV Systems" at www.SMA-Solar.com).

Required devices:

- ☐ Suitable device for safe disconnection and short-circuiting
- ☐ Measuring device for insulation resistance

Device required for safe disconnection and short-circuiting of the PV array

The insulation resistance can only be measured with a suitable device for safe disconnection and short-circuiting of the PV array. If no suitable device is available, the insulation measurement must not be carried out.

Procedure:

1. Calculate the expected insulation resistance per string.
2. **⚠ DANGER**

   Danger to life due to high voltages

   - Disconnect the inverter from all voltage sources (see Section 10, page 86).
3. Install the short circuit device.
4. Connect the measuring device for insulation resistance.
5. Short-circuit the first string.
6. Set the test voltage. The test voltage should be as close as possible to the maximum system voltage of the PV modules but must not exceed it (see datasheet of the PV modules).
7. Measure the insulation resistance.
8. Eliminate the short circuit.
9. Measure the remaining strings in the same manner.
   - ☑ If the insulation resistance of a string deviates considerably from the theoretically calculated value, there is a ground fault present in that string.
10. Reconnect to the inverter only those strings from which the ground fault has been eliminated.
11. Reconnect all other strings to the inverter.

12. Recommission the inverter.
13. If the inverter still displays an insulation error, contact the Service (see Section 17, page 129). The PV modules might not be suitable for the inverter in the present quantity.

12.4 Problems with streaming services

If you use the streaming service in your local network (in which the inverter is also included), there may be interference to the transfer of data. In this case, the IGMP settings of the inverter can be changed via operating parameters.

- Contact the Service and change IGMP settings in consultation with the Service department.

13 Decommissioning the Inverter

⚠ QUALIFIED PERSON

To decommission the inverter completely upon completion of its service life, proceed as described in this Section. If the inverter is defective and you have received a replacement device, observe the information on how to proceed when receiving a replacement device (see Section 15, page 121).

⚠ CAUTION

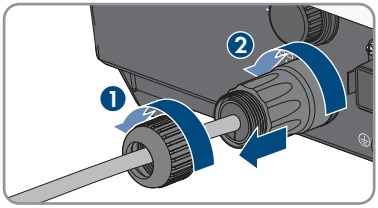
Risk of injury due to weight of product

Injuries may result if the product is lifted incorrectly or dropped while being transported or mounted.

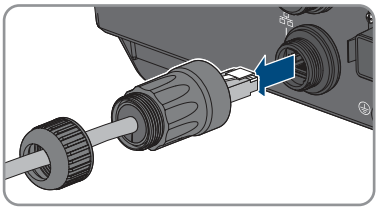
- Transport and lift the product carefully. Take the weight of the product into account.
- Always have two persons mount and disassemble the product.
- Wear suitable personal protective equipment for all work on the product.

Procedure:

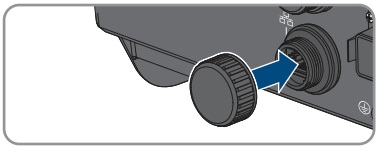
1. Disconnect the inverter from all voltage sources (see Section 10, page 86).
2. Wait 30 minutes for the enclosure to cool down.
3. Unscrew the swivel nut from the threaded sleeve for the network cable.
4. Unscrew and remove the threaded sleeve from the network port thread on the inverter.



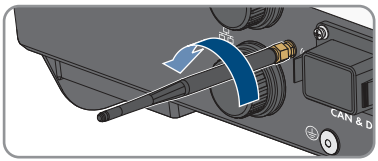
5. Release the network cable plug and pull it out of the jack on the inverter.



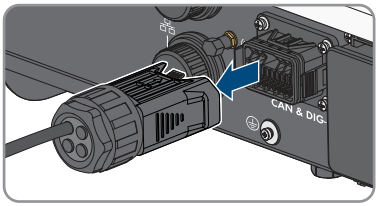
6. Take the cable support sleeve out of the threaded sleeve and remove the network cable from the cable support sleeve.
7. Lead the network cable out of the threaded sleeve and the swivel nut.
8. Put the protective cap on the network port.



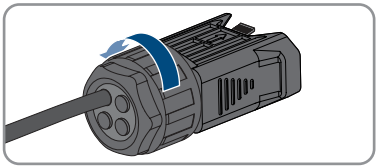
9. Unscrew and remove the antenna.



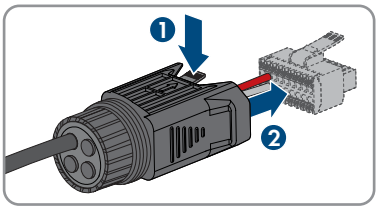
10. If there is a protective cap available, plug the protective cap onto the jack for connecting the antenna.
11. Remove connector from COM socket.



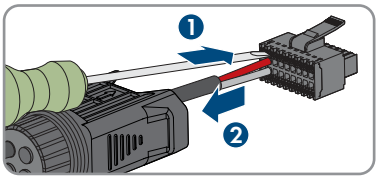
12. Remove the swivel nut from the threaded sleeve.



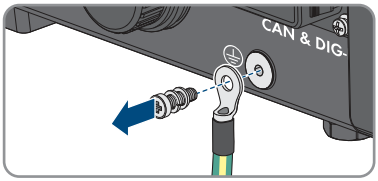
13. Remove the terminal from the threaded sleeve.



14. Remove all conductors from the terminal points using a screwdriver (blade width: 2.5 mm).



15. Put the protective cap on the socket.
16. If an additional grounding or an equipotential bonding is connected to the inverter, unscrew the pan head screw M5x12 (TX25) and remove the grounding cable.



17. Unscrew the left- and right-hand pan head screws M4x14 used to secure the inverter to the wall mounting bracket (PH2).

18. If the protective cover for the connection area is still in place, reattach the protective cover to the inverter. Otherwise, protect the connection area with another sturdy cover.
19. Remove the inverter by lifting it vertically up and off the wall mounting bracket.
20. Unscrew the screws for fastening the wall mounting bracket and remove the wall mounting bracket.
21. If the inverter is to be stored or shipped, pack the inverter, the AC connectors, the DC connectors, the antenna, the RJ45 protective sleeve, the battery connection cables, the connector for connecting the battery communication and the digital inputs and outputs, and the wall bracket. Use the original packaging or packaging that is suitable for the weight and dimensions of the inverter.
22. Dispose of the inverter in accordance with the locally applicable disposal regulations for electronic waste.

14 Procedure when Replacing a Battery

When a connected battery is replaced by a new battery, the battery configuration must be performed.

Procedure:

1. Disconnect the inverter from all voltage sources (see Section 10, page 86).
2. Connect new battery (see (see Section 7.7, page 61) and (see Section 7.5.3, page 50)).
3. Recommission the inverter (see Section 8.2, page 63).
4. Open the user interface (see Section 9.1, page 66).
5. Log in as **Installer**.
6. Start the installation assistant (see Section 9.6, page 74).
7. Click on [**Save and next**] for each step up to the step **Battery configuration**.
   ☑ The new battery has been automatically detected and is already configured.
8. Select **Save and next** until the Summary is displayed.
9. Check the configuration in the summary.
10. Select **Next**.

☑ The battery configuration is being updated. The new battery is captured.

15 Procedure for Receiving a Replacement Device

⚠ QUALIFIED PERSON

Under fault conditions, the product may need to be replaced. If this is the case, you will receive a replacement device from SMA Solar Technology AG. If you received a replacement device, replace the defective product with the replacement device as described below.

Procedure:

1. Decommission the defective product (see Section 13, page 117).
2. Mount the replacement device (see Section 6, page 33) and make the electrical connections (see Section 7, page 37).
3. Commission the replacement device (see Section 8.2, page 63).
4. If the defective product had been registered by a communication product, replace it with the new product in the communication product (see operating manual of communication product).
5. Pack the defective product in the packaging of the replacement device and arrange with SMA Solar Technology AG for it to be picked up.

16 Technical Data

AC terminal

	STP5.0-3SE-40	STP6.0-3SE-40	STP8.0-3SE-40	STP10.0-3SE-40
Rated power at 230 V, 50 Hz	5000 W	6000 W	8000 W	10000 W
Maximum apparent power at cos φ = 1	5000 VA	6000 VA	8000 VA	10000 VA
Rated apparent power at cos φ = 1	5000 VA	6000 VA	8000 VA	10000 VA
Nominal grid voltage	3/N/grounding conductor; 220 V / 380 V 3/N/grounding conductor; 230 V / 400 V 3/N/grounding conductor; 240 V / 415 V	3/N/grounding conductor; 220 V / 380 V 3/N/grounding conductor; 230 V / 400 V 3/N/grounding conductor; 240 V / 415 V	3/N/grounding conductor; 220 V / 380 V 3/N/grounding conductor; 230 V / 400 V 3/N/grounding conductor; 240 V / 415 V	3/N/grounding conductor; 220 V / 380 V 3/N/grounding conductor; 230 V / 400 V 3/N/grounding conductor; 240 V / 415 V
Rated grid voltage	230 V	230 V	230 V	230 V
Voltage range	156 V to 277 V	156 V to 277 V	156 V to 277 V	156 V to 277 V
Rated current at 230 V	3 x 7.3 A	3 x 8.7 A	3 x 11.6 A	3 x 14.5 A
Maximum output current	3 x 7.6 A	3 x 9.1 A	3 x 12.1 A	3 x 15.2 A
Maximum input power for backup loads in parallel grid operation	13800 W	13800 W	13800 W	13800 W
Maximum input current for backup loads in parallel grid operation	3 x 20 A	3 x 20 A	3 x 20 A	3 x 20 A
Rated grid frequency	50 Hz	50 Hz	50 Hz	50 Hz
Operating range at grid frequency 50 Hz	45 Hz to 55 Hz	45 Hz to 55 Hz	45 Hz to 55 Hz	45 Hz to 55 Hz

	STP5.0-3SE-40	STP6.0-3SE-40	STP8.0-3SE-40	STP10.0-3SE-40
Power factor at rated power	1	1	1	1
Displacement power factor cos φ, adjustable	0.8 overexcited to 0.8 underexcited	0.8 overexcited to 0.8 underexcited	0.8 overexcited to 0.8 underexcited	0.8 overexcited to 0.8 underexcited
Feed-in phases	3	3	3	3
Connection phases	3	3	3	3
Grid configurations	TN-C, TN-S, TN-C-S, TT (if U_{N_PE} < 20 V)	TN-C, TN-S, TN-C-S, TT (if U_{N_PE} < 20 V)	TN-C, TN-S, TN-C-S, TT (if U_{N_PE} < 20 V)	TN-C, TN-S, TN-C-S, TT (if U_{N_PE} < 20 V)
Surge category in accordance with IEC 60664-1	III	III	III	III

DC input of PV

	STP5.0-3SE-40	STP6.0-3SE-40	STP8.0-3SE-40	STP10.0-3SE-40
Maximum power of PV array	7500 Wp	9000 Wp	12000 Wp	15000 Wp
Maximum usable input power at Input A	4500 W	5400 W	7200 W	6000 W
Maximum usable input power at Input B	4500 W	5400 W	7200 W	12000 W
Maximum input voltage	1000 V	1000 V	1000 V	1000 V
MPP voltage range	210 V to 800 V	250 V to 800 V	330 V to 800 V	280 V to 800 V
Rated input voltage	600 V	600 V	600 V	600 V
Minimum input voltage	150 V	150 V	150 V	150 V
Initial input voltage	180 V	180 V	180 V	180 V
Maximum usable input current at Input A	12.5 A	12.5 A	12.5 A	12.5 A

	STP5.0-3SE-40	STP6.0-3SE-40	STP8.0-3SE-40	STP10.0-3SE-40
Maximum usable input current at Input B	12.5 A	12.5 A	12.5 A	25 A
Maximum short-circuit current / Input A	20 A	20 A	20 A	20 A
Maximum short-circuit current / Input B	20 A	20 A	20 A	40 A
Number of independent MPP inputs	2	2	2	2
Strings per MPP input	A:1, B:1	A:1, B:1	A:1, B:1	A:1, B:2
Surge category in accordance with IEC 62109-1	II	II	II	II

DC output of battery

	STP5.0-3SE-40	STP6.0-3SE-40	STP8.0-3SE-40	STP10.0-3SE-40
Maximum DC voltage	600 V	600 V	600 V	600 V
Voltage range	150 V to 600 V	150 V to 600 V	150 V to 600 V	150 V to 600 V
Rated DC voltage	600 V	600 V	600 V	600 V
Maximum charge current	30 A	30 A	30 A	30 A
Maximum discharge current	30 A	30 A	30 A	30 A
Maximum charging power	7500 W	9000 W	10600 W	10600 W
Maximum discharge power	6000 W	7200 W	10600 W	10600 W
Number of connectable batteries	1	1	1	1

	STP5.0-3SE-40	STP6.0-3SE-40	STP8.0-3SE-40	STP10.0-3SE-40
Battery type[1]	Li-ion	Li-ion	Li-ion	Li-ion
Surge category in accordance with IEC 60664-1	II	II	II	II

AC output, AC battery-backup system in parallel grid operation mode

	STP5.0-3SE-40	STP6.0-3SE-40	STP8.0-3SE-40	STP10.0-3SE-40
Rated power at 230 V, 50 Hz	5000 W	6000 W	8000 W	10000 W
Maximum apparent AC power	5000 VA	6000 VA	8000 VA	10000 VA
Output power < 5 min	6000 W	7200 W	12000 W	12000 W
Output apparent power < 5 min	6000 VA	7200 VA	12000 VA	12000 VA
Output power < 10 s	10000 W	10000 W	12000 W	12000 W
Output apparent power < 10 s	10000 VA	10000 VA	12000 VA	12000 VA
Nominal AC voltage	3/N/grounding conductor; 230 V / 400 V	3/N/grounding conductor; 230 V / 400 V	3/N/grounding conductor; 230 V / 400 V	3/N/grounding conductor; 230 V / 400 V
AC grid frequency	50 Hz	50 Hz	50 Hz	50 Hz
Switching time to battery-backup operation[2]	< 50 ms	< 50 ms	< 50 ms	< 50 ms
Grid configuration	TN-S	TN-S	TN-S	TN-S

Protective Devices

DC reverse polarity protection	Available
Input-side disconnection point	Available
AC short-circuit current capability	Available
Ground fault monitoring	Available
Grid monitoring	Available

[1] Warning! Danger of fire due to use of non-approved batteries. Only use batteries approved by SMA Solar Technology AG (technical information with list of approved batteries at www.SMA-Solar.com).

[2] Depending on the configured country data set

Maximal output overcurrent protection	32 A
All-pole sensitive residual-current monitoring unit	Available
Overvoltage protection	DC Type II / AC Type II
Active anti-islanding method	Frequency shift

General Data

Width x height x depth	500 mm x 598 mm x 173 mm
Weight	30 kg
Length x width x height of the packaging	595 mm x 795 mm x 250 mm
Weight including packaging	37 kg
Climatic category in accordance with IEC 60721-3-4	4K26
Environmental category	Outdoors
Pollution degree outside the inverter	3
Pollution degree inside the inverter	2
Operating temperature range	-25°C to +60°C
Max. permissible value for relative humidity (condensing)	100 %
Maximum operating altitude above MSL	3000 m
Noise emission, typical	30 dB(A)
Self-consumption (at night)	44 W
Power control / Demand response (DRED)	Communication via Modbus interface
Export limiting in accordance with AS/NZS 4777.2	EMETER-20, HM-20
Demand response mode in accordance with AS/NZS 4777.2	DRM0
Topology	Transformerless (Non-isolated)
Cooling method	Convection
Degree of protection in accordance with IEC 60529 with mounted Wi-Fi antenna	IP65
Protection class in accordance with IEC 62103	I
Radio technology	WLAN 802.11 b/g/n
Radio spectrum	2.4 GHz
Maximum transmission power	100 mW

Wi-Fi range in free-field conditions	100 m
Quantity maximum detectable Wi-Fi networks	32

Climatic Conditions

Installation in accordance with IEC 60721-3-4, Class 4K26

Extended temperature range	-25°C to +60°C
Extended humidity range	0% to 100%
Extended air pressure range	79.5 kPa to 106 kPa

Transport in accordance with IEC 60721-3-4, Class 2K3

Extended temperature range	-25°C to +70°C
Storage temperature	-40°C to +60°C

Equipment

DC terminal for PV	SUNCLIX
DC connection for battery	MC4
AC terminal	AC connector
Battery communication	CAN bus
Speedwire interface	As standard
Webconnect function	As standard
Wi-Fi interface	As standard

Torques

Screw M5x12 for securing the inverter to the wall mounting bracket	2.5 Nm
Screw for additional grounding	1.5 Nm
Attaching the fuse terminal blocks to the AC connectors	0.5 Nm
Attaching the Wi-Fi antenna in a fixed position	1 Nm
Swivel nut of the DC connector	2 Nm

Data Storage Capacity

Daily yields	30 years
Event messages for users	1000 events
Event messages for installers	1000 events

Multifunction relay

Maximum DC switching voltage	30 V
Maximum AC switching current	1.0 A
Maximum DC switching current	1.0 A
Minimum load	0.1 W
Minimum electrical endurance when the maximum switching voltage and maximum switching current are complied with[3)]	100000 switching cycles

Efficiency

	STP5.0-3SE-40	STP6.0-3SE-40	STP8.0-3SE-40	STP10.0-3SE-40
Maximum efficiency, η_{max}	98.0 %	98.2 %	98.4 %	98.4 %
European weighted efficiency, η_{EU}	97.2 %	97.5 %	97.9 %	97.9 %

[3)] Corresponds to 20 years at 12 switching operations per day

17 Contact

If you have technical problems with our products, please contact the SMA Service Line. The following data is required in order to provide you with the necessary assistance:

- Device type
- Serial number
- Firmware version
- Event message
- Mounting location and mounting height
- Type and number of PV modules
- Use the name of the system in Sunny Portal (if available)
- Access data for Sunny Portal (if available)
- Special country-specific settings (if available)
- Detailed description of the problem
- Battery:
  - Type
  - Firmware version

You can find your country's contact information at:

https://go.sma.de/service

18 EU Declaration of Conformity

within the scope of the EU directives

- Radio Equipment Directive 2014/53/EU (22.5.2014 L 153/62) (RED)
- Restriction of the use of certain hazardous substances 2011/65/EU (L 174/88, June 8, 2011) and 2015/863/EU (L 137/10, March 31, 2015) (RoHS)

SMA Solar Technology AG confirms herewith that the products described in this document are in compliance with the fundamental requirements and other relevant provisions of the above-mentioned directives. The entire EU Declaration of Conformity can be found at www.SMA-Solar.com.

19 UK Declaration of Conformity

according to the regulations of England, Wales and Scotland

- Radio Equipment Regulations 2017 (SI 2017/1206)
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

SMA Solar Technology AG confirms herewith that the products described in this document are in compliance with the fundamental requirements and other relevant provisions of the above-mentioned regulations. The entire UK Declaration of Conformity can be found at www.SMA-Solar.com.

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